

GENVA presentation

Dec 15 1960

In charge of Mr LaPierre

Meeting with Assistant Secretary of the Navy Milne, US Navy
December 15, 1960

500,000 to learn

VA of VE tech.

Function

To get the job done

Conclusion

Not motivation - not another name - but tech - ~~getter~~

Evaluate functions Value is appropriate cost Filter Circuit Handles

Identify and Implement

People system - different decision - hundreds - thousands

Shades of gray

Screeners Segment
Arc Clutes

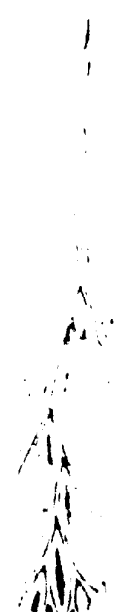
Personal loss Timer motors Any change - high loss

Generalities - rules Suit of clothes Personal loss

Conclusions

- 1 - Perf. time (cost)
 - 2 - Get Training
 - 3 - Don't rely on non-believers
 - 4 - Bid no. of weapons
- Diamond Auto

LD Miles/M



GENERAL  ELECTRIC

DEFENSE FIELD OPERATIONS DEPARTMENT

SUBJECT

COPIES:

December 14, 1960

Format of some of the discussions by the Navy with other companies
on cost savings (as reported by one source)

Opening Remarks by Mr. Milne

- Need for Cost Improvement
- Cold War is Real
- Budgets - 3% Cut
- Mr. Bantz' Memo of 9/9/60

Operational Requirements

- Relaxation of Secondary Requirements
- Substitution of Alternative Equipments

Specifications

- Unreal
- Environmental Testing
- Unwarranted Cross-Referencing

Contracting

- Incentive Contracts

Subcontracting

Tooling & Facilities

Scheduling of Work

Overhead Costs

- Minimize Advertising Costs
- Minimize Recruiting Costs

Value Engineering

LRC/fnw

**GENERAL ELECTRIC
COMPANY**

870 LEXINGTON AVENUE
NEW YORK 22 N. Y.

C. W. LAPIERRE
VICE PRESIDENT

October 19, 1960

Mr. C. P. Milne
Assistant Secretary - Materiel
Department of the Navy
Washington, D. C.

Dear Mr. Milne:

Mr. Paxton has referred to me your letter of October 17 regarding the proposed meeting on costs of weapons systems.

Mr. Paxton has a very tight schedule in the next month or so, and I wonder if I could substitute for him in the proposed meeting? Unfortunately the 14th of November date which you mention is bad for us as we have a long-standing Company meeting which will tie up some of the people involved.

I am asking Mr. Buling of our Washington office to see if we could arrange a more suitable time.

Very sincerely,

C. W. LaPierre

★

Cecil P. Milne
Asst. Secretary of the Navy (Material)

Personal Profile

Personal Characteristics:

Although a U. S. citizen, Mr. Milne was educated in Canada, served in the Royal Navy Volunteer reserve during World War I and has spent most of his life in business in Canada.

He is typical of what we have come to think of as a Britisher or Canadian. He is very reserved - not easily approached - and actually somewhat of a stuffed shirt.

One gets the impression that he has a job rather than that he is a man serving his country at personal sacrifice. He is extremely solicitous of his seniors in the Department.

Mr. Milne was born in Chicago on December 12, 1896. Upper Canada College 1913-1915, University of Toronto 1915-1916. Lieutenant, RNVR 1916-1919.

Married Mildred Conboy Smith, 1920. Mrs. Milne is a very nice person - friendly, personable and intelligent. Three children.

Vice President and General Manager of Massey-Harris-Ferguson, Inc., Racine, Wisconsin. Employed over 30 years. Headed tank production in World War II. In charge of all company operations in U. S.

Deputy Asst. Secretary of Defense (Supply and Logistics) (to Mr. McGuire) Dec. 1957-17 April 1959. Asst. Secretary of the Navy (Material) 17 April 1959- to date.

Organizations in which influential:

Member of Somerset Club and Racine Country Club, Racine, Wisconsin and Milwaukee Club, Milwaukee, Wisconsin.

Vice Admiral Robert B. Pirie, USN

Personal Profile

Personal Characteristics:

An able, intelligent and friendly officer. Although a very high ranking official, he carries his position well and without pomp.

Born 1905, graduated USNA 1926, a naval aviator for over thirty years. He had considerable combat experience in World War II, serving on several aircraft carriers and major staffs.

His background and duties have been essentially military, both at sea and ashore. No duty in a material bureau or naval industrial activity.

Vice Admiral Robert B. Pirie, USN

Post-War Assignments:

| | <u>Command</u> | <u>Staff</u> |
|-------------------------|---------------------------------|---|
| Mar. '45 - Aug. '45 | | Staff, CinC, U.S. Fleet (Air Operations) |
| Jan. '46 - Mar. '48 | U.S.N.A. (Head, Aviation Dept.) | |
| Mar. '48 - July '49 | C.O., U.S.S. Sicily | |
| July '49 - Jan. '52 | U.S.N.A. (Comdt. of Midn.) | |
| Jan. '52 - Jan. '53 | | Ch. of Staff, CINCNELM (Comdr. Naval Forces Eastern Atlantic & Mediterranean) |
| Jan. '53 - July '54 | Deputy CINCNELM | |
| Aug. '54 - Sept. '55 | | Depty. Ch. of Staff, CINCLANT (Comdr. in Ch., Atlantic) |
| Sept. '55 - Feb. '56 | | Chief of Staff, CINCLANT |
| Mar. '56 - July '57 | Comdr. Carrier, Div. 6 | |
| July '57 - May '58 | Comdr., 2nd Fleet | |
| May '58 - Present | | DCNO (Air) |

Vice Admiral John T. Hayward, USN

Personal Profile

Personal Characteristics:

A vigorous, dynamic officer. In addition to being a distinguished naval aviator he has a very strong technical background. He was the first naval aviator to land heavy attack aircraft on board our carriers and he participated in the development of the atomic bomb.

He is very articulate and prone to press strongly to achieve his goals. He seeks new frontiers in naval development and in doing so is very forceful, particularly when opposed. He is inclined to be somewhat intolerant of less gifted individuals, speaking freely in criticism of them.

As is to be expected with his background, he is distinctly "BuWeps oriented."

Admiral Hayward was born in New York City on November 15, 1908, had 15 months' enlisted service before his appointment to the Naval Academy in August 1926. As a Midshipman he excelled in water polo, being a member of Intercollegiate Championship Teams for three years and All-American in 1930. Graduated and commissioned Ensign in 1930, he subsequently advanced to the rank of Vice Admiral in 1959.

Organizations in which influential:

He is recognized by many organizations both civilian and military, as would be expected for a man of his position and background. The Chief of Naval Operations (Admiral Burke) holds him in particularly high esteem and he is a very close friend, at least on an operating basis, of Vice Admiral Rickover.

Special Interests:

None others than as disclosed above. Aviation, atomic and nuclear matters, and weapons systems.

Vice Admiral John T. Hayward, USN

Post-War Assignments:

| | <u>Command</u> | <u>Staff</u> |
|------------------------|---|--|
| July '44 - July '47 | | Experimental Officer NOTS I, Nyokern |
| Aug. '47 - Dec. '48 | | Director, Plans and Operations for Armed Forces Special Weapons Command, Sandia, N. M. |
| Dec. '48 - June '51 | C. O., Composite (Heavy Attack) Squadron 5 | |
| June '51 - May '53 | | Military Applications Division Atomic Energy Commission |
| May '53 - May '54 | C. O., U.S.S. Point Cruz (CVE) | |
| June '54 - Jan. '56 | C. O., N. O. L., White Oaks, Maryland | |
| Feb. '56 - Dec. '56 | C. O., U.S.S. Franklin D. Roosevelt (CVA) | |
| Jan. '57 - Oct. '57 | | Office CNO, Dir. of Strategic Plans Division |
| Oct. '57 - Apr. '59 | | Assistant CNO (R&D) |
| Apr. '59 - Present | | DCNO (Development) |

Vice Admiral George F. Beardsley, USN

Personal Profile

Personal Characteristics:

Pleasant, very efficient and careful. Might be called meticulous.

Born 1907 in Illinois, graduated U.S.N.A. 1929. A naval aviator nearly 30 years. Has had considerable material, fiscal, and contractual experience. Postgraduate course at Carnegie Tech (MS) in aeronautical engineering. Designated for aeronautical engineering duty. Considerable duty in BuAer.

Since February 1959 moved into financial affairs at Navy Department level and became a flag officer. From Deputy Comptroller of the Navy Department, he became Chief of Naval Material in July 1960.

Vice Admiral George F. Beardsley, USN

Post War Assignments:

| | <u>Command</u> | <u>Staff</u> |
|-------------------------|--|---|
| Jan. '45 - Dec. '45 | | BuAerMaintenance Rep. Western District, San Diego |
| Dec. '45 - June '49 | | Director Fiscal Division, BuAer |
| June '49 - Aug. '51 | Dir. Nav. Air. Exp. Sta. NAMC, Phila. | |
| Aug. '51 - July '54 | | Director, Production Division, BuAer |
| July '54 - Sept. '55 | Overhaul & Repair Officer, NAS, Alameda, Calif. | |
| Sept. '55 - Feb. '56 | | Asst. Chief, BuAer for Procurement |
| Feb. '56 - May '58 | | Asst. Comptroller, Div. of Bud. & Rep. Navy Department |
| May '58 - July '60 | | Deputy Comptroller, Navy Dept. |
| July '60 - Present | Chief of Naval Material | |

Rear Admiral Paul D. Stroop, USN

Personal Profile

Personal Characteristics:

A very wonderful person, sincere, honest, fearless and intelligent. A warm and human personality. A dedicated officer whose mind is above selfish motivation. A broad gauge man.

Born 1904 in Alabama, graduated U. S. N. A. 1926. A naval aviator for over 30 years. Postgraduate course in Communications. Duty in both BuAer. and BuOrd. Command at Inyokern. Duty in atomic weapons. Wartime experience mostly staff with planning duty.

An Olympic Team gymnast.

Rear Admiral Paul D. Stroop, USN

Post War Assignments:

| | <u>Command</u> | <u>Staff</u> |
|-------------------------|-------------------------------------|---|
| Nov. '45 - Feb. '46 | | Operations Officer, Staff Comdr. 5th Fleet (West Pacific) |
| Feb. '46 - Sept. '48 | | Fleet Aviation Officer, Staff, C in C., Pacific Fleet. |
| Sept. '48 - Aug. '50 | XO P.G. School, Monterey | |
| Aug. '50 - June '51 | | Student, Natl. War College |
| Aug. '51 - Aug. '52 | C.O. USS Princeton (CV 37) | |
| Oct. '52 - Sept. '53 | C.O. NOTC Inyokern, Cal. | |
| Sept. '53 - Dec. '54 | | Weapon System Evaluation Group |
| Dec. '54 - Mar.'57 | Deputy Chief, BuOrd | |
| Apr. '57 - Mar. '58 | Command U.S. Taiwan Patrol Force | |
| Mar. '58 - Sept. '59 | Chief, BuOrd | |
| Sept. '59 - Present | Chief, BuWeps | |

Vice Admiral William F. Raborn, Jr., USN

Personal Profile

Personal Characteristics:

A wonderful person. Considerate, tactful yet forceful, sincere, honest, fearless and dedicated. A broad gauge officer and a most capable executive.

Born 1905 in Texas, graduated U.S.N.A. 1928. A naval aviator for 25 years.

Career has leaned towards ordnance matters and missile warfare.

Sports: Tennis and boxing.

Vice Admiral William F. Raborn, Jr., USN

Post War Assignments:

| | <u>Command</u> | <u>Staff</u> |
|-------------------------|--|--|
| Nov. '44 - June '45 | Executive Officer, USS Hancock | |
| June '44 - June '47 | | Ch. of Staff, Comdr., Carrier Division Two (Wespac) |
| June '47 - July '49 | | Operations Officer, Comdr. Fleet Air West Coast |
| July '49 - July '50 | | Bureau of Ordnance |
| July '50 - Aug. '51 | C. O. USS Bairoko | |
| Aug. '51 - June '52 | | Student, Naval War College, Newport |
| July '52 - April '54 | | Asst. Dir. Guided Missiles Div., CNO |
| April '54 - Feb. '55 | C. O. USS Bennington (CVA 20) | |
| Feb. '55 - Dec. '55 | | Asst. Ch. of Staff for Operations, Staff C in C, U. S. Atlantic Fleet |
| Dec. '55 - Present | Director of Special Projects, Navy Dept. (Polaris) | |

GENERAL ELECTRIC

DEFENSE FIELD OPERATIONS DEPARTMENT

SUBJECT

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December 12, 1960

| | |
|-----------------|----------------|
| N. E. Firestone | J. H. Martin |
| G. L. Haller | L. D. Miles |
| E. F. Herzog | G. R. Peterson |
| R. E. Horner | F. C. Ruling |
| H. F. Konig | J. D. Wethe |
| C. W. LaPierre | |

The General Electric-Navy meeting on the subject of economy in Navy procurement will be held in the Office of Assistant Navy Secretary (Material) Cecil P. Milne, room 2046, Main Navy Building, on December 15th at 10:30 a. m.

A preliminary meeting of the General Electric participants will be held starting at 9:15 a. m. in room 1036 of the Wyatt Building, 777 - 14th Street, N. W. , Washington, D. C. , for a final review of the topics which might be appropriate for discussion at the meeting. We will also report the latest feedback on the results of meetings between the Navy and other companies.

In order to acquaint you with the Navy people who are expected to be present at the meeting whom you may not know, we have prepared brief personal profiles on each of them, accompanied by a summary of post-war assignments of the military people.

The departments have prepared excellent summaries of their outstanding cost achievements, with emphasis on programs sponsored by the Bureau of Naval Weapons. These summaries have been reproduced for your perusal and are attached. Also included in the summaries are suggested topics for possible discussion of actions which might be appropriate to suggest for the Navy's consideration.

We are fortunate that Mr. L. D. Miles has agreed to attend the meeting and spend some time talking about basic decision making that affects value as well as the Company's value engineering program.



L. R. Cohen

Attachments

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- Topics suggested for possible discussion -- in addition to General Electric experience and results -- at Navy meeting on economy in procurement

Proposed by Flight Propulsion Division

- Improved and expanded use of contractor incentives.
- Procurement in significant quantities to achieve maximum benefits.
- Multi-service use of weapons initially developed by one service or on a tri-service basis.
- Encourage and assist in concurrent production programs for defense and commercial use.
- Intensify efforts to achieve improved planning to avoid "stop and go" in development and production programs.
- Establish realistic requirements and specifications as a step toward achieving substantial cost reductions.
- Apply value analysis techniques in business to information flow procedures and paperwork.

Proposed by Defense Electronics Division

- By LMED:

- Introduce competition in all programs as early as possible.
- Conscientiously call for requirements that are realistic to the actual needs of the equipment.
- Reduce the requirement for unnecessary and duplicate inspection.
- Review technical and administrative report requirements with the objective of reducing them as a significant method of cost-saving.

- By Ordnance Department:

- Provide real incentive formulas on incentive contracts (cost, performance).
- Replace job-order contracts with one open-end type contract.
- Re-examine reporting requirements.
- Re-examine functions of government inspection and supervision of contractors.
- Establish a procedure for approving contractor's method of quality control, purchasing and other functions; then spot-check performance.
- Review Quality Control Documentation with objective of reducing duplication of documents.
- Critically review requirements for packaging of spares.
- Delegate local Navy authority for approval of document changes.
- Examine procedure for contract and amendment negotiation for duplication of Navy effort.

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DEFENSE FIELD OPERATIONS DEPARTMENT

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- Purchase spare parts concurrently with production requirements.
- Maximize purchases of items purchased under each contract.
- Expand system of making block changes.
- Increase participation of industry in Navy's planning.
- Review specifications with objective relaxing nonapplicable requirements.
- Screen competitors at early stage in proposal preparation to reduce unnecessary proposal expenditures.
- Re-examine procedures for disposal of surplus materials.
- Conduct formal Value Engineering Training for Navy personnel; encourage Value Engineering in contracts.

SUBJECT

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December 14, 1960

In addition to the topics previously listed for possible discussion with the Navy concerning future action the Service may want to consider, these suggestions have been submitted by HMED; a more complete summary of their cost savings and related programs and experience is attached.

- Don't change the general construction specifications on existing satisfactory equipment just because a later revision has been issued except to correct specific deficiencies.
- Give contractors more latitude in construction methods so long as they meet good engineering practice and meet service conditions.
- Be more realistic on enclosure requirements.
- Increase awareness of Service personnel of the effect on equipment costs brought about by specification requirements. Frequently these groups frankly state that they don't care what the cost is.
- Expedite requests for parts and subcontract approval.
- Try to avoid buying extremely small quantities of equipment.
- Technical manual, operator manual, etc., specifications and requirements should be reviewed in the light of more realistic requirements.
- If total eventual quantity of equipments to be purchased is large, encourage the contractor to acquire tools which are based on the total equipment quantity requirement and not just on the order at hand.
- Frequently redesigning of equipment for cost saving (after completion of the prototype) can greatly reduce the labor and material cost but again unless the quantity of the equipment ordered is more than nominal, the engineering cost offsets the manufacturing savings.
- The complex problem of reduction of cost of modern weapons and equipment will only be solved by careful attention to thousands of detail problems over a period of time.

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Attachment

GENERAL  ELECTRIC
DEFENSE ELECTRONICS DIVISION

SUBJECT More Defense Per Dollar

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Court Street
Syracuse, N. Y.
December 6, 1960

Mr. F. C. Ruling
General Manager
Defense Field Operations Department
Washington, D. C.

The following comments are submitted for consolidation with your summary in preparation for the meeting with Navy's Assistant Secretary Milne.

1. HMED has engaged in an aggressive cost reduction program for more than ten years. It is an area that has always had top management support and encouragement.

We have a team of specialists representing Engineering, Manufacturing and Finance whose full time job is to aggressively push our cost reduction program. They carry on a continual education program and keep everyone aware of the need for action.

In addition we set up specific planned cost reduction programs on jobs and projects by setting up special task forces.

Attached is a summary report on HMED's cost reduction activity since 1954. Please note that the reduction between 1958 and 1959 was due to transfer of a large segment of personnel and work to DSD.

2. HMED has engaged in Value Analysis education of our Engineering personnel since 1953.

We established a formal team of personnel over a year ago whose full time is applied in this field. This effort also has full endorsement of Management.

We could site numerous examples of reduced cost as a result of this effort. On the SQS-26 Sonar equipment for BuShips a Task Force just completed a study on the transducer which has been accepted and the implemented design changes will account for over \$200,000 in savings.

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DEFENSE ELECTRONICS DIVISION

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December 6, 1960

3. We have been extremely active in automating both our paper work, Engineering design work, Manufacturing release, control and purchasing activities through the use of IBM computers. A continuing task force is in place to continue to look into ways and means through this type of automation to reduce costs.
4. Our Manufacturing Engineering have been active for years in methods and automation to reduce manufacturing costs.
5. We have conducted our own specialized education programs in Engineering to train our technical personnel faster and improve efficiency

The following are a few comments with respect to things the Navy itself might consider in reducing costs.

1. Don't change the general construction specifications on existing satisfactory equipment just because a later revision has been issued except to correct specific deficiencies. For example, typical equipment contract specifications call for the issue of MIL-E-16400 (Electronic Equipment General Specifications) in effect on date of invitation for bids. If followed, this would require a redesign of the construction details and a new selection of component parts for no real purpose. The contract specifications should instead call for the issue of MIL-E-16400 under which the prototype or first production equipment was designed.
2. Give contractors more latitude in construction methods so long as they meet good engineering practice and meet service conditions. For example, our dip solder and printed wiring techniques are possible only with a waiver.
3. Be more realistic on enclosure requirements. Navy test requirements on "Drip Proof" equals commercial "Splash Proof" and Navy "Splash Proof" equals commercial "Water Proof" requirements. (Test for Navy "Splash Proof" calls for a steady stream of water directed on equipment at any angle except straight up.)
4. The present method of drawing up equipment requirements and specifications encourage expensive equipment since each group has its pet ideas on equipment features and won't approve a

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December 6, 1960

project unless their pet schemes are incorporated. Frequently these groups frankly state that they don't care what the cost is.

5. Expedite requests for parts and subcontract approval -- present delays cost money for which the Navy eventually pays.
6. Try to avoid buying extremely small quantities of equipment. We presently have a contract under which 10 equipments were purchased in lots of 1 to 3 equipments at a time. Recently the Navy requested a quotation on 3 more equipments. We quoted quantities of 3, 5, 10 and 20. The unit price for the quantity of 20 was half of the unit price for the quantity of 3.
7. Technical manual, operator manual, etc., specifications and requirements should be reviewed in the light of more realistic requirements. If these specifications are strictly followed (some contractors don't and seem to get away with it), the resulting manuals are expensive, repetitive, and because of the cumbersomness and verbosity actually make them hard for the enlisted personnel to use.
8. If total eventual quantity of equipments to be purchased is large, encourage the contractor to acquire tools which are based on the total equipment quantity requirement and not just on the order at hand. Under the present procurement system only the tooling which gives the cheapest immediate price is acquired. The cost of tooling versus labor cost saving should be evaluated against the total eventual quantity rather than just the immediate quantity at hand.
9. Frequently redesigning of equipment for cost saving (after completion of the prototype) can greatly reduce the labor and material cost but again unless the quantity of the equipment ordered is more than nominal, the engineering cost offsets the manufacturing savings. Yet if the total eventual quantity is great, a substantial overall savings to the Navy may result.

The point of 8 and 9 above is that if the initial production quantity is low, the Navy can save money in the long run by allowing the contractor more money for tooling and cost reduction engineering than can be justified by the contractor on the specific order at hand.

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December 6, 1960

Obviously there is no single magic answer to achieve a sudden reduction in the cost of our present weapons systems and equipment required by the military. This is an extremely complex problem and one that is not going to be solved by even a few basic decisions or philosophies. It will only be solved by careful attention to thousands of detail problems over a reasonable period of time.



E. F. Herzog
Manager - Engineering
Heavy Military Electronics Dept

EFH/np
sttch.

ANNUAL RATE VALUE FOR H.M.E.D. COST IMPROVEMENTS

| <u>Year</u> | <u>Proposals Submitted</u> | <u>Proposals Approved</u> | <u>Savings Approved</u> | <u>Average Savings Per Proposal</u> | <u>Participation %</u> |
|-------------|----------------------------|---------------------------|-------------------------|-------------------------------------|------------------------|
| 1954 | 465 | 370 | \$1,540,099 | \$4,210 | 12 |
| 1955 | 541 | 384 | 1,706,459 | 4,440 | 23 |
| 1956 | 1323 | 860 | 3,884,739 | 4,510 | 54 |
| 1957 | 1790 | 1157 | 4,764,359 | 4,110 | 57 |
| 1958) | 2313 | 1542 | 8,032,164 | 5,200 | 60 |
|)* | | | | | |
| 1959) | 1762 | 1232 | 6,765,680 | 5,410 | 63 |

*Personnel and projects transferred to DSD between 58 and 59.

1960 Average Proposal -- \$4,600

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DEFENSE ELECTRONICS DIVISION

L I G H T M I L I T A R Y E L E C T R O N I C S D E P A R T M E N T
UTICA, N. Y.

December 6, 1960

RECEIVED
DEC 9 1960
F. C. RULING

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Mr. F. C. Ruling
General Manager
DFOD

LMED has been aware of the need to reduce costs in military programs for many years. As a result of this awareness, we have highly effective programs of a continuing nature in operation. The effectiveness of these programs is indicated in the following examples:

(1) Sidewinder

Prior to the establishment of LMED for the production of Sidewinder Guidance Heads, the Navy was experiencing costs per unit in excess of 100% of today's selling price. Such a reduction was made possible by an aggressive Value Analysis Task Force established to operate through 1959. Resulting savings to the Navy are estimated to be approximately \$10,000,000 through this effort.

(2) Polaris

Another outstanding example of cost savings on major Navy procurements has occurred on the Polaris program. Through the various Department sponsored Cost Savings Programs herein described, this Department has been able to affect a savings of approximately \$4,000,000 reflected in the decreased selling price for the products we produce.

(3) Procurement Approval

Following a detailed analysis of the LMED Procurement practice and procedures by the USAF, we have been granted permission to make procurements up to a limit of \$1,000,000 without prior approval by the Contracting Officer.

MORE AND BETTER DEFENSE PER DOLLAR



THRU INNOVATION AND TEAMWORK

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December 6, 1960

(4) Military Recognition of Cost Savings Practices at LMED

From time to time in the performance of our military programs, we have received various letters of commendation dealing with cost savings. As further evidence of the success of our effort in this area, several requests from our customers in the Navy to make detailed presentations have been received.

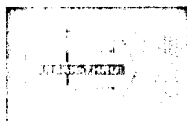
A brief description of the programs making such savings possible, follows:

(1) Value Analysis

Value Analysis is a scientific method of getting the same performance from a product at lower cost. It is a concentrated effort to improve the value of a product by seeking out and eliminating unnecessary costs wherever they may exist in the entire cycle of product design and manufacturing. This program is accomplished by and through cost reduction, cost prevention and efficiency increase.

(2) Value Engineering

Value Engineering is a scientific approach recognizing value, or the lack of it, thereby ferreting out unnecessary cost. The stringent performance demands of functional military hardware is a great multiplier in that cost per function tend to accelerate far above normal industrial cost levels. It is here that the need for better value is strongest, and the rewards greatest. Recognizing this need, LMED in the early 1950's established a Value Engineering component staffed with highly competent people. The rewards have been gratifying as the multiplier is working in the other direction with LMED VALUE ENGINEERING effort consistently returning at least ten times its cost. This has been achieved through intensive product evaluation of components as well as complete systems through task force studies of a complete product effort through Engineering and Manufacturing, or on-the-spot study of foreign competition, and a host of other activities.



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(3) PERT (Program Evaluation Review Technique)

PERT is an effective management tool conceived for planning and evaluating the progress in the development of complex weapons systems - a tool pioneered by the Navy on the Polaris program. This technique provides military and industrial managers with computer prepared situation summaries at bi-weekly intervals which clearly pin-point critical elements in the program and their possible effect on the overall system. "Aviation Week" and "Space Technology" recently cited LMED as "one of the first to see the value of PERT and to adopt it on a voluntary basis before the Department became involved in the Polaris program". This technique is used on all LMED development programs and also in preparing proposals and bids. Our traveling road show explains the operation and advantages which we have presented to other GE Departments, to vendors, and to some of our competitors.

(4) Breakthru '60

Innovation and teamwork, two factors that have led to previous business successes for the LME Department, are the keys to this Department's Breakthru '60 Campaign that is providing "more and better defense per dollar".

Three basic objectives continue to guide our Breakthru '60 progress:

- (a) Develop new markets by increased cost control and competitiveness.
- (b) Enter appropriate new businesses.
- (c) Accelerate the introduction of new and improved products and ideas.



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December 6, 1960

(5) Line of Balance for Dynamic Management Control

Line of Balance is a tool for management which pin-points particular problem areas far in advance by itemizing the present status and future capabilities. This technique provides management with a control insuring timely delivery and the resultant assurance of performing the program scope within the prescribed monetary limits.

Through application of these programs, the management awareness of the need for cost reduction has been communicated and transmitted to every individual in our Department.

While it is difficult to suggest to the Navy, methods whereby they can reduce costs, the following is offered for possible discussion:

- (1) Introduce competition in all programs as early as possible.
- (2) Conscientiously call for requirements that are realistic to the actual needs of the equipment. Too often, it appears that many exacting requirements are called for as a matter of course.
- (3) Reduce the requirement for unnecessary and duplicate inspection.
- (4) The demand for reports, both technical and administrative, has grown to where paper work now represents a significant item of cost in most major contracts. It appears that this is an area where savings could be made without affecting the performance of any weapons.


H. F. Konig, General Manager



**G.E. COST REDUCTION
FACT SHEET**

LJED cost reduction achievements are illustrated by the following:

J79-2 (2 Engines Each Per F4H & A3J, Being Used in Development Testing, USN Evaluation, & in Training)

| Year | (2) Qty. | (2) Tot. J79 | (3) Target S/P | (4) Actual S/P | % Deviation From Target | (1) Direct Mfg. Cost | % Reduction |
|-----------------|-------------|--------------------|----------------------|----------------------|----------------------------|----------------------------|-------------|
| 1958 | 15 | 433 | \$318,410 | \$324,396 | + 1.88% | \$263,254(9) | |
| 1959 | 104 | 306 | 310,325 | 310,126 | - 0.07 | 226,230(9) | 14% |
| 1960 | 30 | 167 | 271,553 | 262,733(5) | - 3.24 | 196,631(9) | 13% |
| Program Average | | | 303,333(6) | 302,021(6) | - .43% | | |

The J79-2 powered the F4H to new worlds speed records for 100 and 500 KM closed courses.

J79-8 (2 Engines Each Per F4H & A3J, Will Be Used in Fleet Deployment Aircraft)

| Year | Qty. | Tot. J79 | Target S/P | Actual S/P | % Deviation From Target | Direct Mfg. Cost | % Reduction |
|-----------------|------|-------------|---------------|---------------|----------------------------|---------------------|-------------|
| 1960 | 54 | 167 | 333,256 | 320,860(5) | -3.72% | 216,972(10) | |
| 1961 | 323 | 501 | 225,432(7) | - | - | 206,360(9) | 19%(10) |
| 1962 | 282 | 518 | 210,477(8) | - | - | 176,903(10) | 5.7% |
| Program Average | | | 227,868(6) | | | 166,843(11) | |

(1) Direct Mfg. Cost Includes

- Direct Material (a) Parts Cost
- (b) Mfg. Losses
- (c) Unreported Losses
- (d) CIDN Costs
- (e) Boxing
- (f) Obsolete & Surplus

(2) Targeted & Actual Quantity

(3) Negotiated Target Where Applicable

(4) Negotiated Final Selling Price Where Applicable

(5) Calculated Based on 1960 Final Target Proposal

(6) Calculated Average Unit Selling Price

(7) 1961 Target Proposal (Not Negotiated) (Dated 10-31-60)

(8) 1962 Proposed Billing Price (Dated 10-31-60)

(9) Function of Actual S/P

(10) Function of Target S/P

(11) Function of Proposed Billing Price

G.E. FLIGHT PROPULSION DIVISION
COST REDUCTION

Cost reduction in Flight Propulsion Division have been affected through Management action both on internally manufactured parts and those purchased outside.

Parts Manufactured by General Electric

One of the key elements of Large Jet Engine Department cost reduction has been the establishment of an organization built around the so-called Unit Manager. A Unit Manager has been established having responsibility for all aspects of the manufacture of each component in the engine. He must account for parts cost in the same sense as he does for quality, meeting schedule, performance, etc. This has been characterized by some as a further extension of the decentralized management concept. Each Unit Manager is assigned and accepts a cost bogie which he must meet within a specific time. Weekly meetings are held with the Manager of Manufacturing to measure progress against this bogie. Supporting bogies are applied throughout the organization including Design Engineering. These costs measurements are made a part of individual job descriptions.

Manufacturability Engineering has been given a strong hand in the initial design of components. To illustrate, a Manufacturability engineer must sign off on new designs before they can be released to the Manufacturing shop.

Value analysis is vigorously and continually used in all phases of design and manufacture.

The effectiveness of these and other Management actions in reducing costs of internally manufactured parts is exemplified by the following table:

| <u>Item</u> | <u>1957</u> | <u>1958</u> | <u>1959</u> | <u>1960 (to date)</u> |
|---------------------------------|------------------|-----------------|-----------------|-----------------------|
| Compressor Rotor | \$40,396 | \$35,718 | \$27,968 | \$22,542 |
| Turbine Rotor | 48,752 | 31,935 | 25,684 | 21,577 |
| Front Comp. Case | 12,785 | 10,918 | 8,749 | 7,907 |
| Rear Frame | 7,597 | 6,304 | 4,541 | 3,386 |
| Turbine Frame | 8,754 | 6,754 | 5,052 | 4,416 |
| TOTAL | \$118,284 | \$91,629 | \$71,994 | \$59,828 |
| % Reduction Per Year | - | 23% | 21% | 17% |

reaching the production stage. Examples of projects now underway are as follows: (1) Parts standardization with the T58 engine; (2) Dual spool rotor in place of individual stage discs; (3) Cast inlet guide vanes; (4) Cast buckets; (5) Integral rear frame and combustion casing.

Purchased Parts

Substantial reductions have also been affected in the cost of purchased parts in LJED. The reorganization in the Spring of 1960 has now made it possible for our buyers to have responsibility for parts from the prototype stage throughout the production program.

We have organized our Materials Group on a continuity basis. That is, one group buys all forgings, another all castings, etc. It is common practice to review vendor costs on a periodic basis. The use of assist and review audits by Government auditors is a further aid in assuring high value.

Working through the small business administration and chambers of commerce invitations are extended to small business to quote on parts we need. Working in this way with small business and others we discover new sources of supply to offer active competition with current sources.

Every effort is made to exploit competitive pressure to achieve low prices. A typical example was a display of 362 parts located where potential suppliers could review the part required, quantity, and "meet or beat" the price that was advertised. Seven hundred and seventy responses were received; 242 quotations on 157 specific parts were for less cost than our best buys in the past. The average price reduction of quotes was 29%. Furthermore, specifications and manufacturing methods are reviewed to obtain cost reductions. The following table illustrates progress made in the area of basic turbo-machinery components:

| <u>Item</u> | <u>Old Price</u> | | <u>New Price</u> | | <u>Percent Reduction</u> |
|-----------------|------------------|---------------|------------------|---------------|--------------------------|
| | <u>Period</u> | <u>Amount</u> | <u>Period</u> | <u>Amount</u> | |
| Turbine Buckets | 1958 | \$16,453 | 1960 | \$10,798 | 34% |
| J79 Vanes | 1956 | 5,683 | 1960 | 3,116 | 45% |
| Turbine Shaft | 1956 | 2,729 | 1960 | 1,900 | 30% |
| Torque Rings | 1956 | 2,991 | 1960 | 1,451 | 52% |

Similar progress has been made in the Controls and Accessories area. To illustrate:

| <u>Item</u> | <u>Date Met with Vendor</u> | <u>Vendor</u> | <u>Savings Per Engine</u> |
|---------------------------|-----------------------------|------------------|---------------------------|
| Nozzle pump | 2/1/60 | Bendix (Utica) | \$500 |
| A/B Fuel Press Valve | 3/17/60 | Parker-Cleveland | 100 |
| Hydraulic Nozzle Actuator | 2/4/60 | Nat'l Waterlift | 200 |
| Torque Booster Actuator | 2/23/60 | " " | 150 |

In accomplishing the above cost reductions variable overhead costs have been reduced. For instance, the ratio of indirect manpower to direct manpower in the Large Jet Engine Department Components manufacture area is as follows:

| | |
|--------|------|
| 1957 - | .874 |
| 1958 - | .863 |
| 1959 - | .779 |
| 1960 - | .648 |

Fabricated blades were originally purchased from a supplier at a "best" cost of \$2.39 each, or \$2,800 per engine. We developed a cold rolling process to produce these airfoils for \$1.00 each for a savings of \$1,600 per engine.

With the increasing prices of bare material, it became necessary to develop a process to obtain forgings from less "billet" material. This was done and precision forging of turbine wheels reduced their cost by 39.5%.

In September 1959 the Small Aircraft Engine Department inaugurated a massive cost reduction program to improve the cost of its production engines; with particular emphasis on its flight qualified engine, the T58-6 turbo-shaft powerplant.

The various sections of the engine (compressor, turbine, combustor, etc.) were each assigned to teams consisting of a design engineer, a manufacturing engineer, a buyer, and a cost accountant. Objective of the teams was to cost-reduce the engine by whatever means available--design changes, process changes, procurement negotiations, and so forth.

The results are beginning to pay off as evidenced by the following:

| <u>Engine Model</u> | <u>Qty.</u> | <u>Shop Cost</u> |
|---------------------|-------------|------------------|
| T58-6 | 89 | \$65,000 |
| T58-8 | 204 | 51,500 |

This represents a learning curve of 86%.

This achievement is all the more remarkable due to the increase in power between the T58-6 and the T58-8 from 1050 horsepower to 1250 horsepower.

Highlights of the reduction from an engineering standpoint are: substitution of a simple speed switch and solenoid in place of an expensive over-speed governor system at a saving of \$2,800 per engine, and elimination of torque sense.

A third Government-sponsored engine project at the Small Aircraft Engine Department, the T64 turbo-shaft turbo-prop, is still in the development phase but is making rapid strides towards cost reduction long before

The high "buy vs. make" ratio on the T58 engine made it imperative to engage in an aggressive campaign to reduce vendor costs. Vendors were invited to make known the high cost areas of production so that assistance could be obtained from General Electric manufacturing and engineering specialists. The learning curve technique was used in negotiations and a General Electric publication concerning the fundamentals of the technique was made available to vendors. Production requirements were coupled with the spare parts requirement to obtain larger orders. High cost vendors were replaced with lower cost vendors, with emphasis on small business.

Highlights of procurement results are as follows:

| | <u>89 engine program</u> | <u>204 engine program</u> |
|------------------|--------------------------|---------------------------|
| Stage I buckets | \$1,347 | \$ 734 |
| Stage II buckets | 971 | 787 |
| Exhaust casing | 2,012 | 1,390 |
| Fuel control | 6,900 | 5,400 |
| Fuel pump | 624 | 498 |
| Splitter vane | 120 | 49 |
| PT buckets | 890 | 785 |

For the future: Other General Electric engine programs have been organized along lines similar to the T58 and results will begin to pay off during 1961 deliveries. In the case of the J85 engine, General Electric faith in its pinch and roll process by a Rutland, Vermont vendor is showing remarkable results. The high cost of domestically produced compressor blades had previously forced General Electric to procure overseas from CENTRAX, Ltd., of England. Cost improvement at Rutland has progressed to the point where Rutland costs are competitive with CENTRAX and forecasts for 1961 indicate considerable improvement.

How Can The USN Help Further

The area of contractor incentives is one in which the Navy can make significant contributions to reduce costs. The use of target incentive contracts has been of material assistance in General Electric. Even greater progress in the area of incentives can probably be made - perhaps through moving farther toward firm fixed price contracts. It is also possible that incentives can be improved through expanding the practice of granting additional rewards for outstanding performance.

In the Government's procurement activity, efforts to buy in significant quantities should be continued and intensified. Navy production people appear to have a good appreciation of the benefits derived in this area. DOD-wide effort along these same lines could prove highly rewarding. In this connection the maximum possible procurement of a given weapon can result in large savings to the Government. Some examples of a move in this direction are current consideration of Navy aircraft, such as the F4H and A3J for the Tactical Air Command, and the "Tri Services" VTOL

activity. Another area for potential improvement is promotion of the widest possible use of a given piece of equipment. For example, the J79 might be used in the A4D or the A2F to increase and thereby reduce costs.

In connection with the above the Government would probably be well advised to encourage and assist in concurrent production programs for the USN, USAF and the commercial industry. Inclusion of commercial production concurrent with that for the Government exposes military production to the severe disciplines imposed by commercial activity, improves efficiency in that a common set of resources in terms of money, manpower and facilities can be utilized. An obvious benefit to concurrent production is that volume for both is increased.

Although the next point has been made many times, it certainly is valid and should constantly be borne in mind. Efforts should be continued and intensified to achieve improved planning to avoid the stop and go activity which has characterized Government procurement in the past. This applies to all phases of contractor activity - production, specific new developments, product improvement and contributing engineering.

Finally, it appears that an opportunity exists for substantial cost reductions in the area of establishing realistic requirements and specifications. Decisions made in the Bureau of Weapons frequently tend to be strongly technically oriented, sometimes without adequate consideration being given to the business aspect. Specific weapon system requirements, once identified, tend to become sacred and sometimes must be achieved without due consideration for the cost involved. A fruitful area for reduction, therefore, is continued objective review by the Government and the contractor of specifications and requirements to assure that a need really exists in those areas which are costly to achieve and that over design merely to satisfy an arbitrary requirement is avoided.

ORDNANCE DEPARTMENT COST IMPROVEMENT ACTIVITIES

PRODUCT DEVELOPMENT AND DESIGN

We are applying the PERT (Program Evaluation Review Technique) to some large proposals.

The Department is:

Developing measures of work effectiveness and has a full time man assigned to this area.

Expanding use of computers in design work.

Striving to improve engineering communications and to reduce paperwork. An engineer is assigned full time to this project.

Proposing grades of documentation tailored to needs of job.

FINANCE

\$100,000 saving in 1960 on Telephone and Telegraph.

Plan to invest \$663,000 in 1960 for IBM 704 computer. Will save \$267,000 in 1961, \$488,000 in 1962 and more in subsequent years.

MATERIALS

Material buyers are continually engaged in critical, in depth, evaluation of suppliers prices. Example: cost of one contract reduced from \$2.6 million to \$2.2. Example: Buyer saved \$99,000 by supplying Polaris supplier with beryllium parts instead of financing facilities.

MANUFACTURING SIMULATION

A job shop simulator ("GEMS" - General Electric Manufacturing Simulator) has been developed and is currently being utilized in analyzing and improving the Department's shop operations by evaluation of alternative decision rules and resource structures. Direct results expected are meeting schedules at lower cost through a reduction in the combined costs of overtime, idle time, expediting, and facilities. Indirectly, this also facilitates reduction in costs of clerical and service personnel through mechanization of production scheduling and control procedures. Extension of this study into functions other than manufacturing is contemplated.

COST REDUCTION PROGRAM

Department has had formal, well-organized Cost Reduction Program since 1951. Success of Program has grown to a 1960 savings of 4.5 million dollars. Twenty-four teams currently participate in the program. Every submitted project is screened at weekly meetings with an emphasis on prompt action.

SUMMARY OF VALUE ENGINEERING EFFORT 1955 - 1960

| | | | | | |
|----------------------|---|-------|---|---------|----------------|
| Proposals submitted | - | 473 | = | \$5,804 | (in thousands) |
| Proposals accepted | - | 286 | = | 3,195 | (in thousands) |
| Acceptance Ratio | - | 60.5% | = | | |
| Proposals in Process | - | 32 | = | 331 | (in thousands) |

| <u>PROGRAM</u> | <u>CUSTOMER</u> | <u>% ACCEPTED</u> | <u>ACCEPTED DOLLAR VALUE</u> |
|--------------------------|-----------------|-------------------|----------------------------------|
| MK-66 Polaris Guidance | BuWeps | 42.6 | \$658 (in thousands) |
| MK-80 Polaris Fire Cont. | BuWeps | 100.0 | 441 |
| MK-12 Talos | BuWeps | 70.9 | 294 |
| MK-44 Torpedo | BuWeps | 50.0 | 19 |
| MK-73 Tartar Director | BuWeps | 38.8 | 48 |
| 024 Atlas Tracker | Air Force | 55.6 | 767 |
| FPS-7 Antenna | Air Force | 60.0 | 153 |
| MPQ-4 Mortar Locator | Signal Corps | 54.7 | 620 |
| SPS-28 Antenna | BuShips | 75.0 | 2 |
| SPS-17 Antenna | BuShips | 71.4 | 15 |
| MK-68 Director Drive | BuWeps | 94.2 | 143 |
| Miscellaneous | | 68.7 | 29 |

Outstanding Activities

LIBRASCOPE - Initiated a pioneering defense cost reduction program through a Value Analysis Seminar conducted at Librascope on their subcontracted portion of the MK-80 Polaris Fire Control. Resulting in potential savings of \$53,000 on MK-80 and \$414,000 on SUBROC and ASROC.

PROJECT 10-44 - Under Contract NOrd-19004 (\$20,000) a Value Engineering on the MK-44 Mod O Torpedo was conducted. Resulting in potential savings of \$3,106.00 per torpedo. This could allow Navy to procure five torpedoes for present cost of four.

REDUCTION IN FORCES SIMULATOR

The effects of a reduction in forces in terms of numbers of employees displaced, increased production costs, and the disruptive effects on skill groupings and work schedules long have been the concern of the management of cyclic businesses.

To meet this need for predictive information, the Ordnance Department in July 1960 undertook a project involving the programming of an IBM 650 computer to simulate the aspects of a reduction in forces. The successful conclusion of this project will give management an opportunity to really understand the effects of a proposed layoff in terms of number of people displaced, waves of displacement, ultimate layoffs and all the costs associated with these: including training costs, income extension costs, idle time costs, etc.

SOCCO

"SOCCO" (System of Competitive Cost Objective) is a management tool to systematically establish, predict, measure and control the cost performance of development programs during design and the early stages of manufacture. Currently in use at the Ordnance Department, on SPS 30 Antenna Program, it provides an early check and balance system for program money management.

SUGGESTIONS TO NAVY

CONTRACTS

Incentive Contracts

It is recommended that the Navy use the profit motive to its advantage by resorting to real incentive formulae on firm price incentive types of contracts. Further, strong consideration should be given to greater use of incentive cost types of contracts where the incentive is pegged to the cost and performance.

Job Order Type Contracts

It is recommended that job order type contracts be replaced by one open-end type of contract. This would reduce Navy and contractor personnel required to administer these contracts.

INSPECTION AND REPORTING

Unnecessary Reporting

Administrative costs are rising rapidly because of increased reporting requirements. In some cases a costly reporting system is desirable, but in reality imposes a "frill" which neither industry nor the Navy can afford. It is recommended that reporting systems be examined with this in mind.

Government Inspection and Supervision of Contractors

A critical examination of the functions of government inspection and supervision of contractors with a view towards eliminating some of these functions would appear to be a profitable cost reduction area. It appears that a great deal of money is expended in compiling unnecessary statistics, financial data, inspection records, etc. The size of some of these inspection organizations is such that not only are they expensive to maintain, but demands made on contractor personnel are extremely time consuming and in many cases detract from getting the primary job done.

Spot-Check Inspection

It is recommended that a procedure be established for investigating and approving a contractor's method of quality control, purchasing and other functions, and then spot check performance on particular jobs. Present methods require the Navy to inspect products in detail which is a duplication of effort with Company quality control employees.

POLICY

Quality Control Documentation

It is recommended that Quality Control Documentation be reviewed to determine if QAP's, OCD's, FAT's and similar type documentation could be replaced by vendor's documents which would effectively serve the same purpose and would not require the effort presently necessary to effect changes or improvements in them.

Packaging Requirements on Spare Parts

It is recommended that Specification No. SP-4030.1 (and others in the same category) be reviewed and applied only on those parts which are of a critical nature which would be damaged by normal spare parts packaging.

Documentation Changes

It is recommended that authority be delegated to resident government personnel to approve changes of documents. This would eliminate the costly and time-consuming procedure of sending them to Washington for approval.

Negotiations

It would be helpful if the double negotiations presently required for contracts and amendments were simplified, as both RINSMAT and Contracting Section of BuWeps negotiate every amendment and contract that we submit.

Purchase of Spare Parts

Price advantages could be realized if spare parts were purchased with their production counterparts in cases where spares are known to be needed from the start.

Maximizing Purchases

Reductions in cost of contracts would be realized if a policy is followed of maximizing the number of items being purchased. Ideally one contract could be let for the amount needed in a particular fiscal year. This would result in a threefold saving: less quotation effort, less negotiation effort and lower unit prices.

Block-Changes

The system of making changes in blocks should be expanded. Introduction of a group of changes into equipment at one time rather than introducing them individually as they come up would certainly reduce total cost of incorporation.

Industry Planning Support

It would be advantageous to the Navy to include industry's top creative engineers in advance thinking of military engineers and scientists. This would allow more time to consider cost reduction matters early and it would provide a better and more profitable utilization of time.

Specifications

It is recommended that a general review of specifications for equipment be conducted with the goal of relaxing controls which are not required. It is costly to apply general specifications to all equipment whether it is needed for a particular application or not.

Proposal Effort

A policy of requesting only management proposals in the early stages of a program would eliminate "also rans" early in the game before they have expended needless effort. Such a screening process would appear to be in order on most large programs which require a high degree of management and resources participation.

MISCELLANEOUS

Disposition of Surplus Materials

The present system is to inventory, store, cost, prepare complete description, submit to property administration for disposition instructions, and store in locked area. This takes many IME (Indirect Manufacturing Expense) man hours and consumes floor space which at present involves leasing additional buildings. A savings could be realized if the disposition process could be speeded up. One solution would be to delegate the local cognizant government offices the authority to dispose of material within a certain dollar value or quantitative limitation.

Value Engineering

Through cooperation of American Ordnance Association and industry organize and conduct formal Value Engineering training for key Navy personnel. Provide Navy Value Engineering liaison between contractor and Navy. Objective: expedite cost reductions.

Encourage Value Engineering effort in contracts, with a monetary provision for outstanding performance.