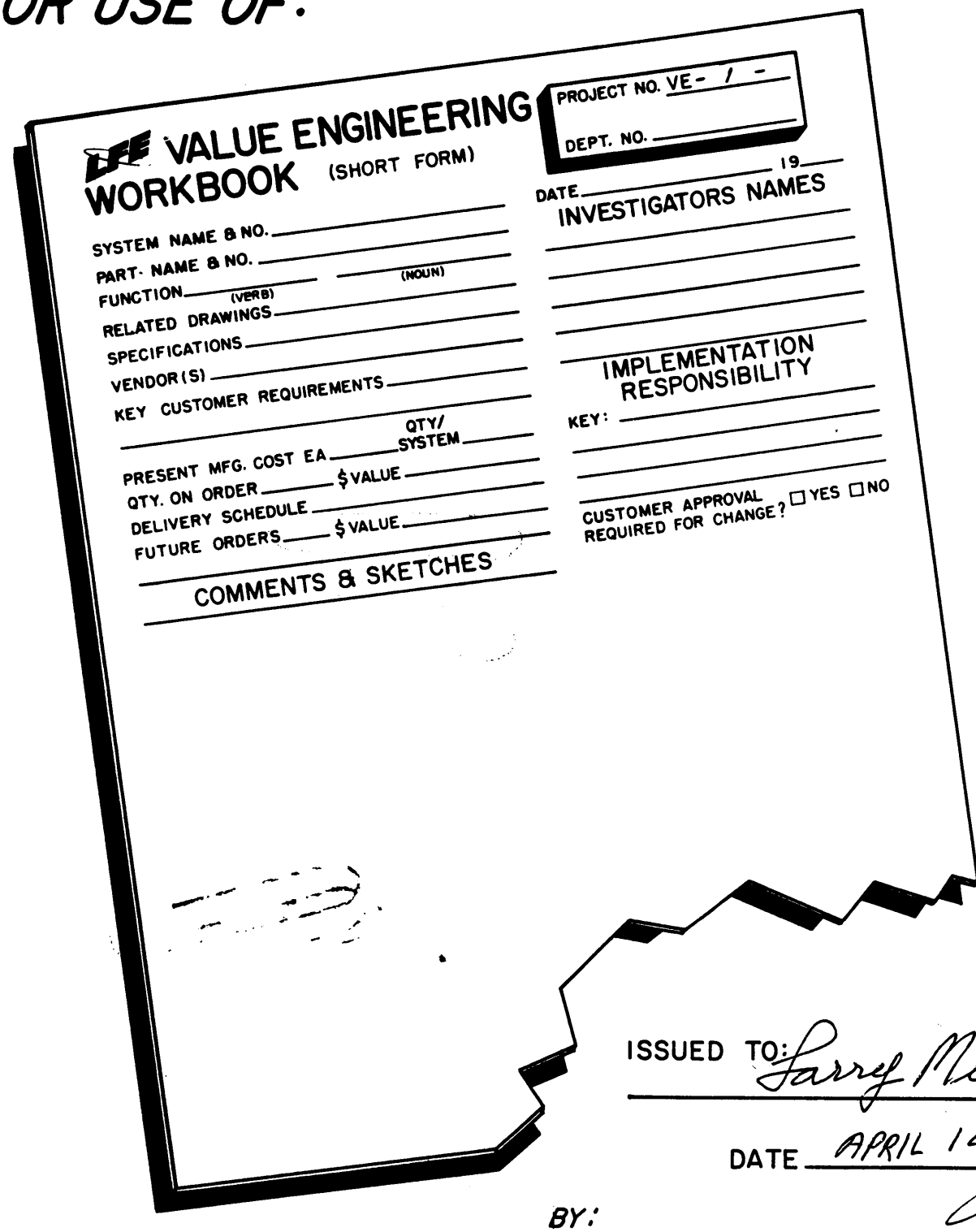
INSTRUCTIONS
FOR USE OF:



ISSUED TO: Larry Miles

DATE APRIL 14, 1966

BY:

LAB FOR ELECTRONICS
1075 COMMONWEATH AVE
BOSTON, MASS.

PURPOSE OF THIS FOLDER

Value Analysis is a rigorous body of techniques with certain outstanding features:

1) Its development was not purely logical and analytical but was rather an empirical process. Its effectiveness in reducing cost was surprising, at first, even to its developers.

2) It contains no basic elements of novelty. It is merely a unique combination and arrangement of known philosophy and technique.

3) Though it is partly a philosophy, partly a science, its successful application constitutes a way-of-life; a VIEWPOINT.

4) Its successful application requires that its SEQUENCE be maintained, that all bases be touched; that each of its steps be taken in order.

This folder and its companion sheet, the LFE VALUE ENGINEERING WORKBOOK (SHORT FORM) are intended to help the practitioner of Value Analysis to force his VA effort to follow the required sequence; to maintain the required viewpoint.

It is intended that this folder and the workbook be used only by persons who have shown proficiency in Value Analysis by graduation from a VA Workshop Seminar. It is unlikely that a successful Value Analysis can be performed by any person not so trained and motivated.

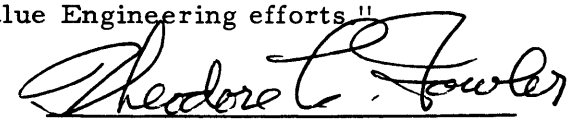
Pages 16 through 29 of this folder constitute an exceedingly condensed Value Analysis Seminar. Those elements which are left after condensation might be likened to a shorthand transcription, in that they convey nothing useful except to a person skilled in the art. As such, however, they are a valuable refresher for the Value Analysis Seminar graduate.

LFE POLICY

(Excerpts from LFE Division Standard Practice on Value Engineering)

"LFE Electronics will apply the techniques of Value Engineering to its products and procedures to the maximum extent commensurate with good management practice."

"Each LFE employee whose activities can significantly affect the cost of LFE products is charged with the responsibility of using the techniques of Value Engineering in his daily activities. His annual salary and performance appraisal will take note of the effectiveness of his Value Engineering efforts."



Theodore C. Fowler, Manager
VALUE ENGINEERING
April 1966

DEFINITIONS

VALUE ANALYSIS or VALUE ENGINEERING

The systematic application of recognized techniques which identify the function of a product or service, establish a worth for that function, and provide the necessary function reliably at the lowest overall cost.

VALUE

The relationship between function and cost. Value is the lowest price we must pay for a reliable function or service.

USE VALUE

The monetary measure of the properties of a product or service which contribute to performance.

ESTEEM VALUE

The monetary measure of the properties of a product or service which contribute to saleability, but not to performance.

COST VALUE

The sum of labor, material, burden and all other elements of cost required to produce an item or provide a service.

EXCHANGE VALUE

The market price for a product or service.

FUNCTION

The natural or characteristic action performed by a product or service.

COST TARGETING

Applies to a design effort. It controls each contributor to the design by specifying the required manufacturing cost of the device for which he has design responsibility, in terms of the labor and material content of the ultimate production-item.

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	PAGE		PAGE
PURPOSE	1	THE VA JOB PLAN	20
POLICY	1	THE CONCEPT OF COMPARISON	21
DEFINITIONS	2	THE CONCEPT OF FUNCTION	21
DETAILED INSTRUCTIONS	3 - 12	CREATIVE BEHAVIOR	22
SAMPLE WORKBOOK	13 - 15	COST TARGETING	25
WHY VALUE ANALYSIS?	16	DOD INCENTIVES	26

PROJECT NO. VE-63/7-43

DEPT. NO. 4803-VE

DATE July 18 19 63

INVESTIGATORS NAMES

D. J. Wrauskie

D. Driscoll

D. C. Fowler

IMPLEMENTATION RESPONSIBILITY

KEY: B. A. Shaw

F. Casper

B. Bodick

CUSTOMER APPROVAL REQUIRED FOR CHANGE? ☒ YES ☐ NO

1 Project numbers are assigned sequentially from the record book in each Laboratory, Department or other Company unit.

2 "Dept. No." is the number of the record book from which project no. is assigned. In the example 4803-VE means Dept. 4803, Value Engineering Office.

3 Date on which Project number is assigned.

4 List names of all members of VE team.

5 It is important at the outset of a VE Study that all effort be focussed upon and verified with the person who must ultimately approve and implement any proposed changes. Enter the name of the key man whose responsibilities are involved.

6 Check here whether any proposed "class 1" type change could be approved within LFE, or whether specific customer approval would be required before any change could be made.

COMMENTS & SKETCHES

Use sketches or photos to clearly and graphically describe the item being analyzed. When final recommendations are developed, attach photos or sketch the new configuration.

As part of the Information Phase, clearly describe the item being analyzed. Contact all Departments, asking at least the following questions.

A. Customer 1. Who is the ultimate user? 2. What features are really needed? 3. Are the specs too tight?

B. Marketing 1. Potential sales? 2. To whom? 3. Our price compared to competition? 4. Names of competitors?

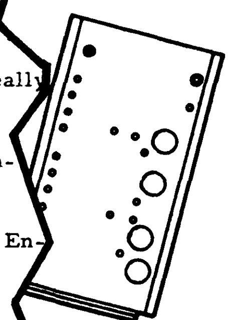
C. Engineering 1. What is the function? 2. Unusual features? 3. Environmental requirements? 4. Weight and volume limitations? 5. Human factors, esteem, appearance?

D. Manufacturing 1. Problem areas? 2. Special processes? 3. Materials? 4. Tooling? 5. Flow?

E. Purchasing 1. Sources? 2. Target prices? 3. Vendors? Problems?

NOTE

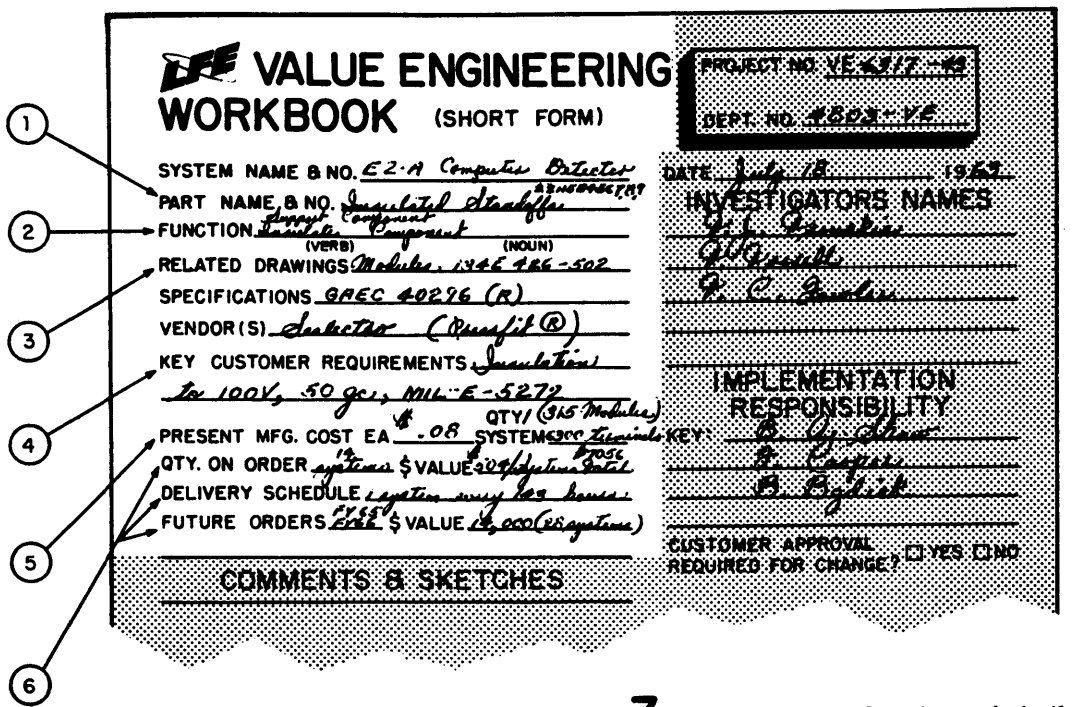
Leave plenty of room for additional comments to be recorded as significant data is developed throughout the analysis. The INFORMATION PHASE NEVER STOPS.



...ODULE PLATE 134E 231

(A) (B) (C) (D) (E) ONLY ... the ... entire ... n extrusion for ... is tooled with our

SPECIFICA... DC, (2) Typical frequencies: 40 cm Hg, (3) Structure of module plate comprises major portion of structural integrity of mounting frame.



1 The specific part or component, assembly or subassembly, which is to be Value Analyzed.

2 The BASIC FUNCTION of an item is "the one function which, if all else had to be removed, must remain for the item to do its job."

The defining of function is a difficult and challenging procedure. It is suggested that it be performed in two steps:

FIRST: Write down every conceivable definition.

SECOND: Select the best one.

Do not permit the FUNCTIONAL DEFINITION to be expanded into more than two words. A many-worded definition is usually not a functional definition at all, but is invariably a description of a way to implement the function; a description of the hardware.

Do not even use an adjective in addition to the VERB and NOUN unless the 2-word definition is unworkably broad.

The ideal verb is demonstrable on a non-verbal level. The ideal noun is a parameter, or measurable quantity.

In addition to the two-word DEFINITION of the function, it is desirable to record a concise series of SPECIFICATIONS of the function. These should be recorded at the very bottom of this page.

3 Enter here any drawings of similar items in the system or other effected assemblies. Explain the relationship below.

4 What specific features does the customer regard as critically important?

Include "esteem" or SELL features as well as "use" or PERFORMANCE features.

5 Use Meaningful costs. If historical cost data is not available, estimates are satisfactory, if properly supported on paper. Any cost data must be made a part of this record.

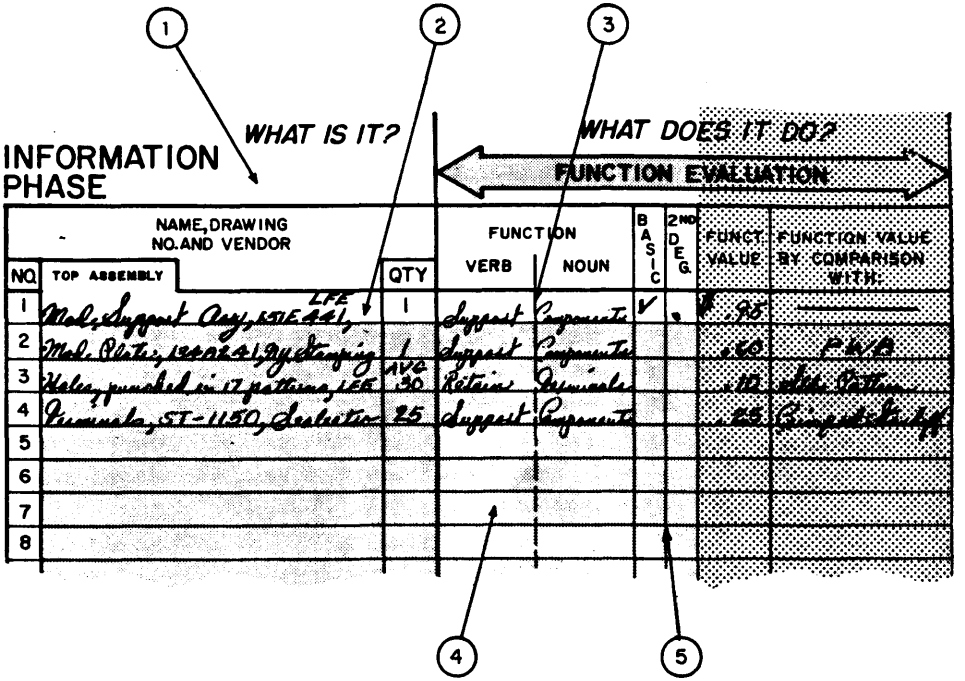
Attach any estimates or quotations to Page 4.

6 Information on present and future production quantities and schedules is often misquoted. Always, GET YOUR INFORMATION FROM THE BEST SOURCE, in this case, Marketing.

NOTE

This is the initial step in the INFORMATION PHASE of the Value Engineering Job Plan. It is invariably here that the major "errors of omission" are committed.

Many hours of later effort are saved by spending a few extra minutes in the collection and/or verification of information at this stage.



1 The clear area (top line) is to be filled in ALWAYS. It covers the specific item or assembly being Value Analyzed. The shaded area is used, when analyzing assemblies only, to list the Parts of the assembly for a rigorous evaluation of supporting functions.

---

2 Copy part name and number from page one. Add vendor's name. If made in-house, indicate "LFE".

---

3 Copy BASIC FUNCTION from page one.

---

4 Define the basic function of each part of the assembly.

Use the same rigorous methods used in defining the basic function of the top assembly on page one.

Again, "THE BASIC FUNCTION of an item is the one function which, if all else had to be removed, must remain for the item to do its job."

---

5 It is clear that the top-line item performs the Basic Function indicated. A permanent check has been put in the "Basic" column to emphasize this point.

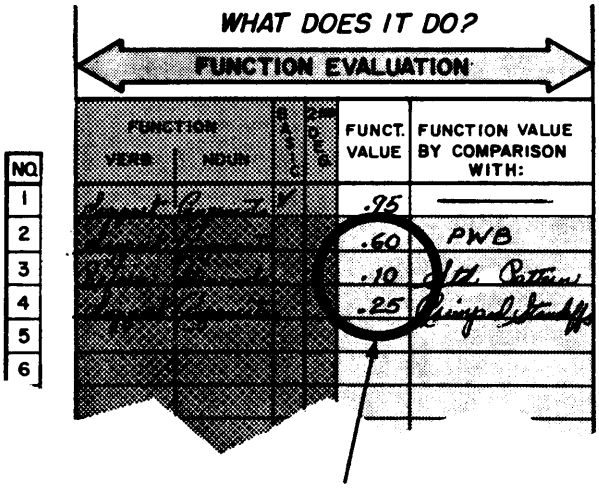
It is now necessary to determine whether each PART of the top assembly performs a function which is also basic TO THE TOP ASSEMBLY.

Each part had its basic function carefully defined in the "Function" column, but the question here is: IS THAT FUNCTION BASIC WHEN CONSIDERING THE ASSEMBLY AND NOT THE PART? IF NOT, IT IS 2nd DEGREE.

Establishing a FUNCTIONAL VALUE or "Worth" by merely jotting in a subjective estimate would be obviously worthless. The objective here is to establish an artificial, but firmly based dollar target, called in Value Analysis, a BASIC FUNCTION VALUE STANDARD (BFVS). This is, by definition, a lower cost than it is possible to achieve by any known means. (In fact, when the ratio of COST to BFVS is 3 or less, we usually regard the item as having very high VALUE.)

In spite of its artificial nature, it has a rather firm, reasoned foundation, and thus can serve as a TARGET toward which the designer or Value Analyst can shoot. This is its function. It replaces the usual hardware-oriented targets of the past.

It also serves, simply, as a Signal of Poor Value. Ratios of COST to BFVS of 10 or 20 to 1 (which are typical of most Industrial Products) are obvious indications of unnecessary cost. Total the FUNCTIONAL VALUES of the parts (shaded areas) to the top of the columns (clear area). This total figure represents a BASIC FUNCTION VALUE TARGET.



NOTE

If the item being analyzed is a part, not an assembly, i.e.: if the shaded area is not used, perform the same evaluation on the Part, and enter Functional Value directly on the top line.

The procedure by which these figures are developed is not Magic. Neither is it based on mysterious and involved calculation.

It is simply this:

STEP 1: Considering only the functional description (ignoring the PART), generate a large quantity of ideas as answers to the following questions.

WHAT READILY AVAILABLE ITEM WILL PERFORM THE FUNCTION?

WHAT DOES IT COST?

The ideal list will contain "commonplace" items, (as illustrated in Figure 1). Admittedly the faucet won't do the whole job of the PART, which may have to control the flow of coolant in a heat exchanger, but it does perform the BASIC FUNCTION: that is to CONTROL FLOW, and we do KNOW ITS COST.

Examples:

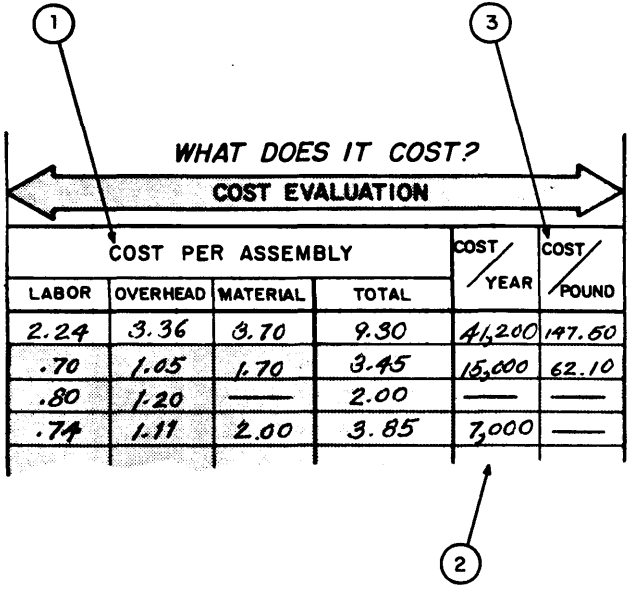
FUNCTION	IDEA
Control flow	Faucet
Illuminate area	Desk lamp
Retain Pressure	Pressure cooker

(Fig. 1)

We thus have a series of artificial but firmly supportable dollar figures.

STEP 2: Select, from this list, the lowest cost item which will truly perform the function. Here, a good deal of judgement must be applied. In the example, a 60¢ printed wiring board was chosen to implement the function "SUPPORT TERMINALS". Ideas which were discarded included "metal plate", "rubber cement", and "buss wire". The objective is to define an item which will just barely do the actual job required, without necessarily fulfilling all of the interface and environmental requirements.

1 The source of these figures can be 1) quotations by a vendor 2) estimates, by vendor or within LFE or 3) guesstimates by a vendor or within LFE. Indicate source of figures under COMMENTS on page 1.



2 Cost per year can be a very significant motivator under circumstances where, for instance the item being analyzed is also used, or could be used on other Company products. Indicate basis for this figure under COMMENTS on page 1.

3 Cost per pound is an optional evaluation which serves as a powerful motivator for the investigator. It can also be an effective call-to-action, to motivate others, presented, for instance in this form:

> "BUT THIS ELECTRONIC CIRCUIT COSTS 4 TIMES AS MUCH AS 24k GOLD!"

An example of another very useful application of COST/POUND:

> An aluminum sand casting cost $1.43/POUND. This was a signal, indicating possible unnecessary cost, since the raw material only costs $0.23/POUND.
>
> Further inquiry reinforced the signal, showing that COST/POUND for similar aluminum castings was about $0.55/POUND.
>
> It developed that modification of two features of draft and special coring lowered the cost to $0.67/POUND.
>
> COST/POUND is a similar motivator on fabricated parts, and has been effective on gearboxes, electronic circuitry and aircraft instruments.

1 The division of costs into Functional areas presents a clear picture of just what each dollar DOES. Just as the initial definition of FUNCTION is the key to the Value Analysis process, the further definition of the FUNCTION performed by each dollar of cost permits logical comparisons and interrelationships to be developed.

A few suggested Functional areas:

ELECTRICAL	TIMING	STORAGE
MECHANICAL	ESTEEM	COMMUNICATING
SUPPORTING	AMPLIFYING	HEATING
RADIATING	OPTICAL	MAGNETIC

The Procedure:

1) SELECT functional areas.

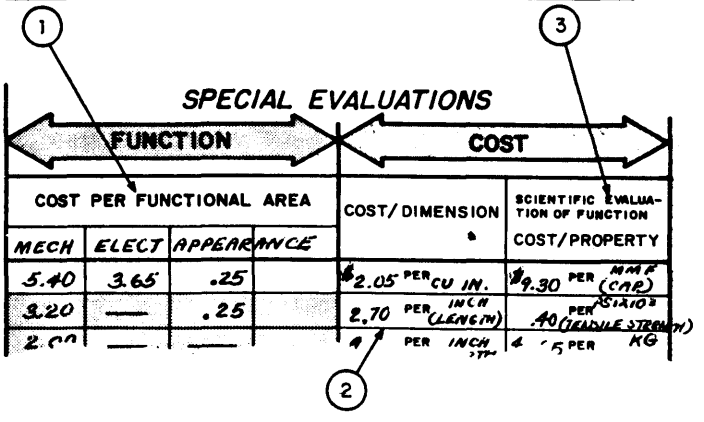
2) ALLOCATE costs of parts of the assembly to appropriate functional areas. (Perform this operation only on the parts; that is: the items in the shaded area.)

3) TOTAL the figures to the clear spaces on the top line.

> NOTE
>
> If the item being analyzed is a part, not an assembly, i.e.,: if the shaded area is not used, perform the same allocation on the Part, and enter allocated costs directly on the top line.

Note that in the example, the division of costs to functional areas appears to be a logical one. There is no poor value SIGNAL.

Poor value is typified by, for example, 10¢ worth of electrical function, supported by $10.00 worth of mechanical structure.



2 Another optional evaluation, to be performed on the top assembly is Cost per unit LENGTH, BREADTH, WIDTH, AREA OR VOLUME. This often gives signals of poor value by permitting uncluttered comparisons with costs per dimension of similar items.

Like COST/POUND, this technique relates to the standard measures by which we buy raw materials.

EXAMPLES:

Material	$/Cubic inch
Hot Rolled Steel	0.034
Chrome-Van-Moly Steel	0.068
Aluminum	0.064
Silver-bearing copper	0.135

3 COST/PROPERTY is an approach to that ultimate dream of the Value Analyst: A MEASURING STICK FOR VALUE.

> NOTE: This procedure is intended to apply only to the top line item.

Whenever the FUNCTION can be defined using a noun which is a PARAMETER, or measurable quantity, a link has been established with scientific handbooks where alternate solutions are developed and documented as a science. Thus evaluations can be made on fixed scales as for example: DOLLARS PER WEBER/METER of susceptibility.

An example, based upon a high tension line insulator stud:

Material	Cost/100,000 in. lb.
High carbon steel	1.8¢
Low carbon steel	2.7¢
Stainless steel	7.0¢

High Carbon Steel will fulfill the Functional requirement at the lowest cost. The BASIC FUNCTION VALUE STANDARD for a 90,000 inch pound high tension line insulator is therefore 1.7¢.

The Procedure:

1) SELECT: Determine which measurable parameters could apply to the item being analyzed. (Essentially this means redefining elements of the total function in terms of different parametric verbs.)

2) REFER to handbooks for circuits, materials, structures or components which will "supply" these parameters and record in this column the values from the handbook.

   COMPARE: Determine which of the surveyed methods is the lowest cost. This becomes the BASIC FUNCTION VALUE STANDARD (BFVS), and constitutes the basic cost target.

SPECULATIVE PHASE

WHAT ELSE WILL DO THE JOB?

LIST ALL IDEAS

1	ELIMINATE	16	insulate with glass
2	weld leads - no support	17	metal straps
3	Lube of RTV silicone rubber	18	Japanese mounting ( )
4	printed wiring board	19	corrugated paper
5	terminal board	20	glue together
6	slip board	21	sockets
7	put into a block	22	stake termin
8	soda straw	23	weld
9	rubber bands	24	resistance
10	fiberglass terminal board	25	fluid bed
11	paradigm for insulation	26	ceramic
12	silicone for insulation	27	crimp into e
13	rubber beehive	28	Universal
14	use a glob	29	leads into
15	solder w/o support & fluid bed dip	30	bolt leads

BRAINSTORM RULES

1. DEFER JUDGEMENT
2. CRITICISM IS RULED OUT
3. FREE WHEELING IS WELCOMED
4. QUANTITY IS WANTED
5. COMBINATION AND IMPROVEMENT ARE SOUGHT

Apply the two key principles of Value Analysis Creative Thinking:

JUDGEMENT DEFERMENT and MENTAL CONTAGION

The ideal group creative session comprises 4 to 7 compatible people, generally of the same organizational level, but with different technical backgrounds. It is desirable to have at least one person experienced in each field which might become an area of major discussion (Electrical, Heat Transfer, Pneumatics, etc.), but it is not usually desireable to have present anyone with a subjective interest in the present design of the item being analyzed.

Brainstorming should be the initial technique used, alternating with other methods from time to time as the session progresses.

CHECKLISTS- Make your own or use OSBORN'S key word list.

ATTRIBUTE LISTING- Isolate major characteristics of Function. Consider each in turn.

INPUT-OUTPUT- Define input, output and specifications. Focus on each in turn.

THE BUZZ SESSION- Set time period of 2-3 minutes for rapid fire individual or group ideation.

FORCED RELATIONSHIPS- Force associations between apparently unrelated items.

MORPHOLOGICAL ANALYSIS- List variables on 2 axes of graph. Consider all combinations.

Record every idea which develops.

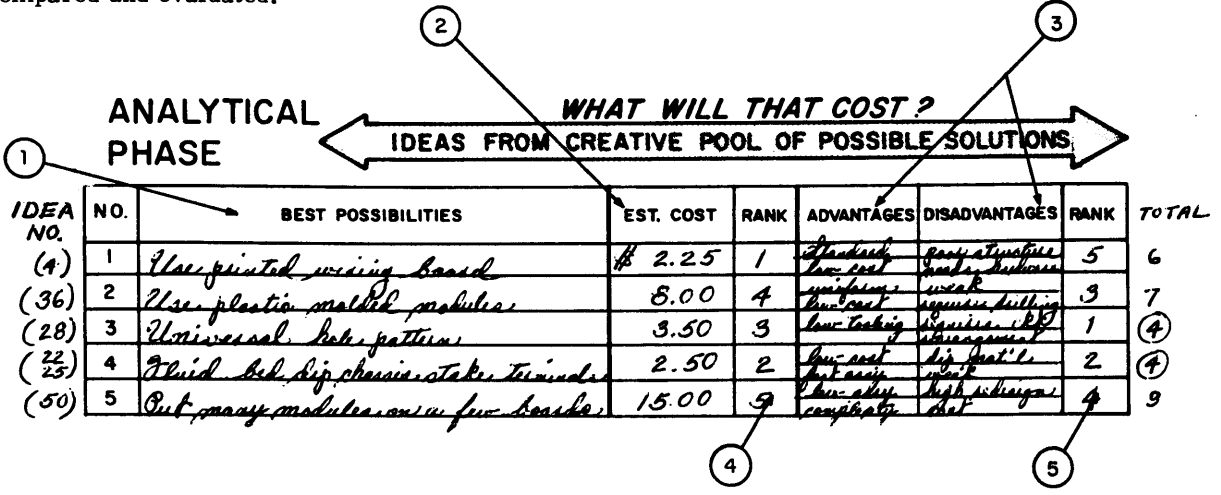
"Mull it over". Give the ideas an incubation period. After a day or two, review the lists and record any further ideas. Finally accumulate all ideas in a nonrepetitive list for refinement.

The reduction of the large quantity of Creative ideas from the Speculative Phase into a few good ideas in the Analytical Phase is accomplished through a Process called REFINEMENT.

The objective of this procedure is to substitute order for the inherent randomness of a Creative Idea List.

The human mind cannot simultaneously handle more than seven divergent thoughts.

The REFINING process groups the ideas into lists which have a common denominator and which therefore can be compared and evaluated.



1 To REFINE the creative idea list, work on a separate sheet of paper. Perform the following in rigorous sequence:

(a) IDENTIFY: Choose five or so categories to which the ideas can be allocated:

(b) ALLOCATE: Rewrite idea list, allocating each idea to its proper category.

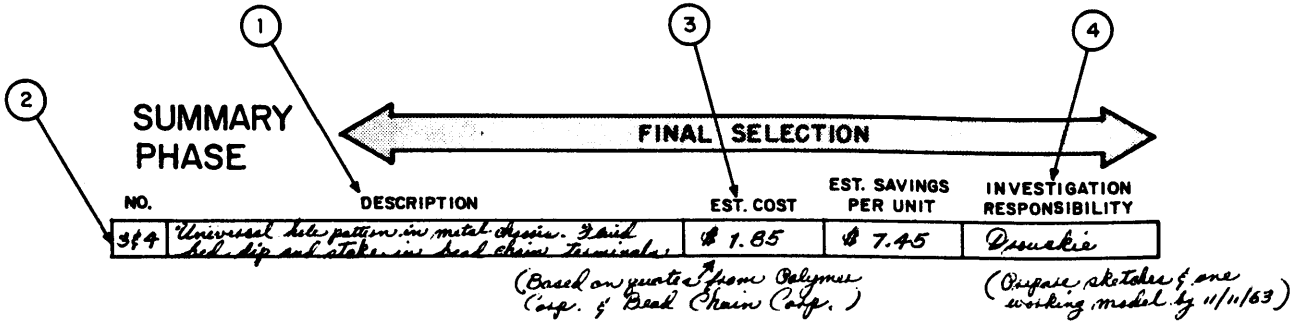
(c) SELECT: Each categorized idea list can now be evaluated on a common basis. List promising projects in the five spaces provided.

2 Best estimate of cost, preferably based on written quotations.

3 Use concise (one- or two-word, if possible) statements of all known significant advantages and disadvantages including TOTAL cost, ease of implementing, salability, etc. An extra worksheet is sometimes helpful. Attach it to the top of Page 4.

4 Lowest cost item is ranked number one.

5 Item which is most advantageous is ranked number one.



1 Through a process of logical, judicial thinking choose the final recommendation from the five suggestions above. This is where we reestablish ALL of the judgement which was suspended or "deferred" in the Creative Phase. Factor in the time element and the degree of perfection required. Is the item to be mass produced or are we building just one? What are the consequences of failure? Make sample calculations to determine feasibility. Perform tests. Consider factory tolerances. Above all, look back to the problem as it was originally defined, and be sure you have a solution.

---

2 Copy the number of the selected idea from the list above.

3 Here the cost must be defined to a fairly high degree of accuracy. Each element of cost should be backed up by a written and signed quotation or estimate.

---

4 Typically at this point there is much further investigation required before the final selection can be submitted to the person responsible for implementing the change. Enter here the name of the person who is assigned by the Value Analysis Team to perform this final investigation.

List the items which he is to investigate on page 1 under COMMENTS or on a separate memo. Attach a copy.

Set deadline dates for the conclusion of each element of this investigation.

The cost data required here is self explanatory.

As a basic guide remember: ESTIMATE PESSIMISTICALLY.

PROGRAM EXECUTION PHASE

NON RECURRING COSTS	HRS	$
DESIGN	250	3,000
DRAFTING	475	3,500
EVALUATION	125	1,000
MODEL SHOP	—	—
PUBLICATIONS	110	1,000
TECH LABOR	140	1,000
TOOL DESIGN	125	1,000
TOOL FAB	140	1,000
MFG. METHODS	55	500
MISC	—	—
TOTAL	1420	12,000 (C)

	DIRECT MATERIAL	DIRECT LABOR	VARIABLE PORTION OF OVERHEAD	TOTAL VARIABLE COST PER PIECE
PRESENT COST	$3.70	$2.24	$3.36	$9.30 (A)
PROPOSED COST EST	.95	.30	.60	1.85 (B)

NOTES:

NET SAVINGS

1. DIFFERENCE IN VARIABLE COST (A MINUS B) — $7.45
2. TOTAL NUMBER OF PIECES — 4410
3. TOTAL GROSS SAVINGS (1X2) — $32,855
4. LESS: NON-RECURRING COSTS (C) — 12,000
5. NET SAVINGS — $20,855 (FY64)

(Savings for FY 65 & 66 approx $65,000)

COMPLETED BY D. J. Pawlikie DATE 12/12 19 69

TO BE SUBMITTED TO B. A. Shaw

CHECK ONE ☐ VARIATION ☒ DEVIATION

IMPLEMENTATION

REA NO. _____ DATE _____

ECO NO. _____ DATE _____

Enter any implementation action, together with dates, names, document numbers, and UPDATE as status changes.

"SELLING THE IDEA": If the preceding Value Study was performed as a part of your regular design effort on an item for which you have design responsibility, you don't need to "sell" your proposal. You have already "sold" it to yourself. If, however, someone else will be responsible for implementation, the proposal must be "Marketed".

A most effective epitaph to any idea is the statement, "It will be used because it's obviously better."

The only direct and effective approach is to:

(1) Determine who is responsible for implementation.

(2) Determine the advantages to him of accepting the idea.

(3) Make these advantages obvious to him.

MAINTAIN COMPLETED WORKBOOK FORMS
IN A SEQUENTIAL FILE FOR REFERENCE

LFE VALUE ENGINEERING WORKBOOK (SHORT FORM)

PROJECT NO. VE-6317-43

DEPT. NO. 4803-VE

SYSTEM NAME & NO. E2-A Computer Detector DATE July 18 1963

PART NAME & NO. Insulated Standoffs **1158456789

FUNCTION Insulate (VERB) Support Component (NOUN)

RELATED DRAWINGS Modules 134E426-502

SPECIFICATIONS GAEC 40296 (R)

VENDOR(S) Sealectro (Pressfit ®)

KEY CUSTOMER REQUIREMENTS Insulation to 100V, 50 gc, MIL-E-5400 Class 2

PRESENT MFG. COST EA $.08 QTY/SYSTEM (315 Modules) 6300 terminals

QTY. ON ORDER 4 systems $ VALUE $504/system, $7056 total

DELIVERY SCHEDULE 1 system every 143 hours

FUTURE ORDERS FY 65 14 each FY 66 $ VALUE $14,000 (28 systems)

INVESTIGATORS NAMES

D. J. Dzenkis

P. Dopell

D. C. Fowler

IMPLEMENTATION RESPONSIBILITY

KEY: B. R. Shaw

J. Cooper

D. Bzdick

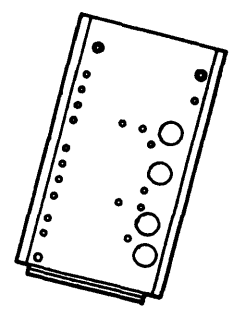
CUSTOMER APPROVAL REQUIRED FOR CHANGE? ☒ YES ☐ NO

COMMENTS & SKETCHES

** This project was originally chosen because of huge quantity of terminals used per system. Project was expanded to include the module plate after the function of the terminal was defined as "SUPPORT COMPONENT". This is obviously also the function of the module plate. Thus the part being analyzed is MODULE PLATE, 134E231-238. (17 similar module baseplates with terminals installed.)

Present Construction: Raw stock is 6061-T6 Al extrusion (3/4") notched, punched, drilled and formed in house. Terminals are press pressed into plate.

TERMINAL ST1150



MODULE PLATE 134E 231

(A) Item used on Gu... W2F pressfit. Must stand turboprop environ...

(B) No competition except Gu... who can pull production in house. Price pressure on price. No potential ...oduc... outside beyond W2F program.

(C) The extremely ... tolerance on the terminal O.D. (+.002 -.001) is ...ess... with Teflon, and is the reason for high cost. If metal FEP were used cost would be 50% less, but tolerance would be ±.003 to .005.

(D) Mfg. cost is fairly high because of req'd tight tolerancing on holes and individual pressing-in of terminals. Automating of these processes is not easy.

(E) ONLY ONE Vendor on terminals - SEALECTRO. The aluminum extrusion for the module plate costs $13.60/pound. Only one vendor is tooled with our extrusion die.

SPECIFICATIONS OF THE FUNCTION ① Max Voltage 175 VDC, ② Typical frequencies 40 cps Hg, ③ Structure of module plate comprises major portion of structural integrity of mounting frames

INFORMATION PHASE

WHAT IS IT? | WHAT DOES IT DO? — FUNCTION EVALUATION | WHAT DOES IT COST? — COST EVALUATION | SPECIAL EVALUATIONS — FUNCTION | COST

NO.	NAME, DRAWING NO. AND VENDOR — TOP ASSEMBLY	QTY	FUNCTION VERB	FUNCTION NOUN	BASIC	2ND DEG.	FUNCT. VALUE	FUNCTION VALUE BY COMPARISON WITH:	COST PER ASSEMBLY LABOR	OVERHEAD	MATERIAL	TOTAL	COST/YEAR	COST/POUND	COST PER FUNCTIONAL AREA MECH	ELECT	ANALOGUE	COST/DIMENSION	SCIENTIFIC EVALUATION OF FUNCTION COST/PROPERTY
1	Mod. Support Assm, 1215E441, LPB	1	Support	Component	✓		.95	—	2.24	3.36	3.70	9.30	41,200	147.50	5.40	3.65	.25	2.05 PER CU. IN.	9.30 PER MMF (CAPACITANCE)
2	Mod. Plate, CERAMIC, Mylar	1	Support	Component	✓		.60	PWB	.70	1.05	1.70	3.45	15,000	62.10	3.20	—	.25	2.70 PER INCH (LENGTH)	.40 PER PSI X 10³ (TENSILE STRENGT
3	Mounting Hardware Kit	AR	Retains	Terminals	✓		.10	Sock. Patterns	.80	1.20	—	2.00	—	—	2.00	—	—	.53 PER .001 (THICKNESS)	4.65 PER KΩ (DIELECTRIC CONST
4	Terminal, ST-1160 Solder	25	Support	Component	✓		.25	Pimpled standoffs	.74	1.11	2.00	3.85	7,000	—	.20	3.65	—	4.65 PER INCH WIDTH	.002 PER VOLT (DIELECTRIC STRE
5																		1.32 PER 50 INCH (AREA)	PER
6																		PER	PER
7																		PER	PER
8																		PER	PER
9																		PER	PER
10																		PER	PER
11																		PER	PER
12																		PER	PER
13																		PER	PER
14																		PER	PER
15																		PER	PER
16																		PER	PER
17																		PER	PER
18																		PER	PER
19																		PER	PER
20																		PER	PER

NOTE! TOTAL COLUMNS TO TOP OF PAGE ——— SHADED AREA IS FOR SECOND LEVEL ITEMS ONLY ——— CLEAR AREA IS FOR EVALUATING THE TOP ASSEMBLY ONLY

SPECULATIVE PHASE

WHAT ELSE WILL DO THE JOB? — LIST ALL IDEAS (SUPPORT COMPONENTS – INSULATE COMPONENTS) — CREATE! — DEFER ALL JUDGEMENT

1	ELIMINATE	16	insulate with gloss
2	weld Leads – no support	17	metal straps
3	dabs of RTV silicone rubber	18	Japanese mounting ( )
4	printed wiring board	19	corrugated paper
5	terminal board	20	glue together
6	slipboard	21	pockets
7	pot into a block	22	stake terminals
8	soda straw	23	weld
9	rubber bands	24	resistance solder
10	fiberglass terminal board	25	fluid bed dip chassis
11	sandize for insulation	26	ceramic
12	silicone for insulation	27	crimp into rings (house wiring)
13	rubber beehive	28	Universal Hole pattern
14	use a glob	29	Leads into rigid foam pad
15	solder No support & fluid bed dip	30	bolt Leads together

BRAINSTORM RULES

1. DEFER JUDGEMENT
2. CRITICISM IS RULED OUT
3. FREE WHEELING IS WELCOMED
4. QUANTITY IS WANTED
5. COMBINATION AND IMPROVEMENT ARE SOUGHT

31	self tapping screws in pc board	46	Honeycomb
32	plug components into pockets	47	nest in foam
33	use formed plane aluminum sheet	48	tubing
34	use thermoformed plastic sheet	49	acoustical tile
35	molded thermoplastic	50	Use Mother boards
36	molded thermoset	51	wire wrap
37	use plywood	52	welded wire matrix
38	twist Leads together	53	
39	use spade lugs on Leads	54	
40	mount components in sleeves	55	
41	clip components into plastic piping	56	
42	use MICs (Integrated circuits)	57	
43	Hold components w/ pigtail	58	
44	Dy-Wraps	59	
45	Facing Card	60	

STAPLE ALL PERTINENT DATA HERE (SKETCHES, NOTES, ESTIMATES, QUOTATIONS, LETTERS, ETC.)

ANALYTICAL PHASE

WHAT WILL THAT COST?

IDEAS FROM CREATIVE POOL OF POSSIBLE SOLUTIONS

	NO.	BEST POSSIBILITIES	EST. COST	RANK	ADVANTAGES	DISADVANTAGES	RANK	TOTAL
(4)	1	Use printed wiring board	$ 2.25	1	Standard low cost	poor electrical needs hardware	5	6
(36)	2	Use plastic molded modules	8.00	4	uniformity low cost	weak requires potting	3	7
(28)	3	Universal hole pattern	3.50	3	low tooling	requires ckt arrangement	1	④
(22, 23)	4	Fluid bed dip chassis-stake terminals	2.50	2	low cost	dip mat'l	2	④
(30)	5	Put many modules on a few boards	15.00	5	low quantity simplified	high engineering cost	4	9

SUMMARY PHASE

FINAL SELECTION

NO.	DESCRIPTION	EST. COST	EST. SAVINGS PER UNIT	INVESTIGATION RESPONSIBILITY
3&4	Universal hole pattern in metal chassis. Fluid bed dip and stake in "bead chain" terminals	$ 1.85	$ 7.45	Rzouskie

PROGRAM EXECUTION PHASE

(Based on quotes from Palnut Corp. & Bead Chain Corp.)

(Prepare sketches and one working model by 11/1/63)

NON RECURRING COSTS	HRS	$
DESIGN	250	3,000
DRAFTING	475	3,500
EVALUATION	125	1,000
MODEL SHOP	—	—
PUBLICATIONS	100	1,000
TECH LABOR	140	1,000
TOOL DESIGN		1,000
TOOL FAB		000
MFG. METHODS	55	500
MISC	—	—
TOTAL	1420	12,000(C)

	DIRECT MATERIAL	DIRECT LABOR	VARIABLE PORTION OF OVERHEAD	TOTAL VARIABLE COST PER PIECE
PRESENT COST	$ 3.70	2.24	$ 3.36	$ 9.30 (A)
PROPOSED COST EST.	.95	.30	.60	1.85 (B)

NET SAVINGS

1. DIFFERENCE IN VARIABLE COST (A MINUS B) — $ 7.45
2. TOTAL NUMBER OF PIECES — 4410
3. TOTAL GROSS SAVINGS (1X2) — $ 32,855
4. LESS: NON-RECURRING COSTS (C) — 12,000
5. NET SAVINGS — $ 20,855 (FY64)

(savings for FY 65 & 66 approx $65,000)

NOTES:

COMPLETED BY D. J. Rzouskie DATE 12/12 19 63

TO BE SUBMITTED TO B. A. Shaw

CHECK ONE ☐ VARIATION ☒ DEVIATION

IMPLEMENTATION

REA NO. 140341 DATE 1/7/64

ECO NO. AN58E443 DATE 6/16/64

Submitted to product line for action on December 18, 1963. Scheduled to start engineering program Jan 18, 1964

Changed drawings to reflect new design 6/16/64.

The theme of this brief refresher could be called "Larry Miles and how VA Grew." This is intentional. Presenting the material in the form of a logical, historical evolution removes VALUE ANALYSIS from the realm of black magic and clearly establishes it as a unique engineering discipline.

WHY VALUE ANALYSIS?

In 1948, Harry Ehrlicher, G. E. Vice President of Manufacturing Services, in an attempt to develop an organized approach to cost reduction from a Purchasing standpoint, assigned electrical engineer Lawrence D. Miles to a new project.

His mission was essentially to determine whether Value could be quantized, analyzed, and ultimately optimized through an organized approach.

Miles' investigations over the next several years carried him through the empirical evolution of what was to be called Value Analysis. The reasoning process was induction, and the elements of the investigation can be greatly oversimplified into four steps:

1) Determine the conditions which cause industrial products to contain unnecessary cost.

2) Determine the basic causes for these conditions.

3) Hypothesize methods which might eliminate these causes.

4) Try these methods on actual products.

Miles spent much time on steps one and two.

His original list of "Reasons for Unnecessary Cost" included twelve categories:

(1) Engineers' other Responsibilities

(2) Lack of Time

(3) Habits and Attitudes

(4) Lack of Information

(5) Pre-Conceived Ideas

(6) Prejudice

(7) Temporary Circumstances

(8) Lack of Ideas

(9) Lack of Experience

(10) Failure to Use Available Specialists

(11) Desire to Conform

(12) Fear of Personal Loss

Building on this very firm base, Miles and his group then repeatedly applied steps three and four, gradually building the store of knowledge and experience which is Value Analysis.

Out of this effort came a Discipline; a Methodology which was recorded and disseminated throughout the several hundred GE installations.

It has been called a:

TECHNIQUE PHILOSOPHY ART SCIENCE or JUST CLEAR THINKING

And all of these are accurate, but the best word is: METHODOLOGY: "The Science of a Special Form of Procedure".

The "special form of procedure" which is Value Analysis revolves around the VALUE ANALYSIS JOB PLAN.

The philosophy in Value Analysis, operating within the framework of the JOB PLAN, is chiefly represented by three elements:

The concept of EVALUATION BY COMPARISON	The concept of EVALUATION OF FUNCTION	The procedure of CREATIVE PROBLEM SOLVING

The TECHNIQUES, or the elemental PROCEDURES of Value Analysis are listed below in two categories:

The rigorous:

ANALYZE: COSTS

COST ELEMENTS

COMPONENT & PROCESS COST

COST/YEAR

COST/POUND

COST/DIMENSION

COST/PROPERTY

EVALUATE: FUNCTION

BASIC FUNCTION

and the conceptual (those involving the frame-of-mind, approach, attitude, point-of-view):

(1) Avoid Generalities; Get Down to Specifics

(2) Get All Available Costs-Understand Their Meaning & Limitations

(3) Give Credence Only to Information From the Most Reliable Source

(4) Blast, Create, Then Refine

(5) Use Real Creativity

(6) Identify & Overcome Roadblocks

(7) Use Industry Specialists to Extend Specialized Knowledge

(8) Get a Dollar Sign On the Key Tolerances

(9) Utilize Vendors' Available Functional Products

(10) Utilize and Pay For Vendors' Skills and Knowledge

(11) Utilize Specialty Processes

(12) Utilize Applicable Standards

(13) Use the Criterion "If It Were My Money, Would I Spend It This Way?"

A number of decisions were made during this 1948-1952 period which established the method by which Value Analysis would be applied in the industrial organization. These basic principles have remained as the "Standard Method", and to date no organization has successfully maintained a Value Analysis Program by any method which deviated substantially from these principles:

TRAINING:

1) A substantial portion of those members of the organization who affect product cost are trained in the principles of Value Analysis in forty to eighty hour seminar training programs.

2) In order to reinforce the training, a Workshop Seminar approach was developed, wherein teams of four participants perform a Value Analysis of a "live" project, achieving two major objectives:

a. Since the practice project is usually successful (That is; a cost saving usually results) the training effort tends to pay for itself.

b. It is also usual, if the seminar is capably taught and if the student is able to control his inhibitions, for the student to reach a point in the seminar where, in "trying out" the techniques on a project, (as Miles' "tried" them in 1950) he suddenly sees the process working, so to speak, "before his eyes".

This "enlightenment" was what supported and encouraged Miles, and repeated many thousands of times with seminar students, it has also proven to be the key to successful VA training programs.

APPLICATION:

1) A small but highly qualified central group of Value Analysis specialists is the only truly effective organization for a Value Analysis Program.

2) The central group must report to middle management. (below the President or General Manager, but above the lowest organizational level.

3) It is highly effective whether reporting to Engineering, Operations (Manufacturing, Industrial Engineering), or in the case of products with low Engineering content and stable configuration, to Purchasing.

4) Cost Targeting of developmental programs through the leadership and coordination of COST TARGET TEAMS has recently become an important function of Value Analysis.

5) The effectiveness of a Value Analysis effort is multiplied very greatly through the use of a Task Team concept, wherein a cross-disciplinary group of investigators from Manufacturing, Engineering and Purchasing are formed into a HORIZONTAL team for the purpose of Value Analyzing a specific product.

THE VALUE ANALYSIS JOB PLAN

One of Miles' early conclusions, based chiefly on his Engineering background, was that any cost reduction effort must start with an organized Plan-of-Attack.

His choice of a model was, quite logically, the so-called "Scientific Method":

RECOGNIZE

DEFINE

SEARCH

EVALUATE

CONCLUDE

Again, by combination and redefinition, he established a sequential plan for analyzing Value, the VA JOB PLAN, with five phases:

INFORMATION PHASE

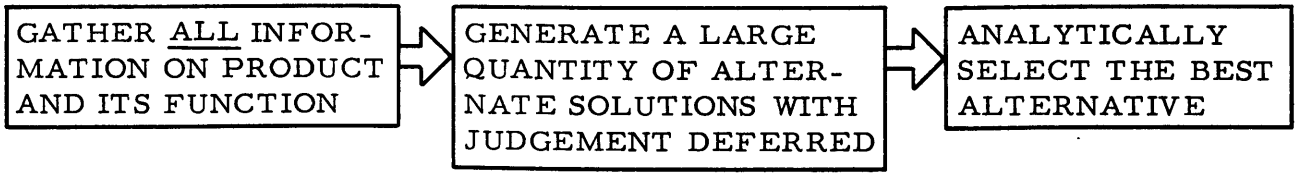
SPECULATIVE PHASE

ANALYTICAL PHASE

PROGRAM PLANNING & EXECUTION

SUMMARY PHASE

The sequence of the first three of these phases must be maintained in order for the process of Value Analysis to work.



A rather common error is to move to the next phase before rigorously exhausting the possibilities of a previous phase.

Experience indicates that this negates the Value Analysis effort. Two keys to the successful analysis of Value are:

CONSIDER EVERY TECHNIQUE and MAINTAIN THE SEQUENCE

THE CONCEPT OF COMPARISON

Again we refer back to 1948-50. Miles attempted to develop a Theory of Value which could be applied in the Industrial organization. His researches led him from the modern economists to the ancient philosophers, and his conclusion, basic to the development of Value Analysis as a separate discipline, was that none of the existing theories satisfied a practical situation in the physical world, and that his first objective must be to define Value in terms which a perceptive modern man can use.

Step one in his direction was the conclusion that:

VALUE IS RELATIVE

THERE IS NO SCALE OR MEASURING STICK FOR VALUE

THE VALUE OF AN ITEM CAN ONLY BE ESTABLISHED BY COMPARING IT WITH ANOTHER ITEM.

Thus was established another basic concept of Value Analysis:

IF VALUE CAN ONLY BE ESTABLISHED BY COMPARISON OF ALTERNATES

THEN:

A PRIME OBJECTIVE OF VALUE ANALYSIS IS THE DEVELOPMENT OF ALTERNATES

This clearly establishes the basis for the Value Analysis dependence on Creative Thinking, but also raises the question: "Alternates to do what?" and we introduce the second major concept of Value Analysis:

THE CONCEPT OF FUNCTION

Value Analysis has been called, "Function-Based Cost Reduction". It refuses to ask the question: 'How can I make this part for less?", but instead it asks two questions: (1) "What is the Function of this part?", and then (2) "What is the lowest cost method of providing this function?"

The process of defining function is not an easy one, even to a trained and experienced Value Analyst. It requires study and introspection. It is a process of repeatedly asking yourself:

IS MY DEFINITION TOO BROAD?

IS IT TOO NARROW?

DOES IT TRULY DESCRIBE WHAT THE DEVICE DOES? — OR IS MY JUDGEMENT AFFECTED BY MY KNOWLEDGE OF WHAT IT IS?

POSSIBLY I SHOULD DEFINE THE FUNCTION IN TWO DIFFERENT WAYS. — OR THREE.

Finally, NEVER BE SATISFIED. Constantly second-guess yourself. All of your effort in the Speculative Phase is based on the foundation established in Functional Definition.

CREATIVE BEHAVIOR

The basis for the deep involvement of Value Analysis with Creative Behavior was established in the Definition of Value. (see discussion on Page 21).

By logical development:

VALUE CAN BE
ESTABLISHED ONLY BY COMPARISON,

VALUE IS DEFINED AS
THE LEAST COSTLY OF ALL
THE POSSIBLE WAYS OF PER-
FORMING THE REQUIRED FUNCTION,

THEREFORE: A BASIC REQUIREMENT
OF VALUE ANALYSIS MUST BE TO
HYPOTHESIZE A GREAT QUANTITY OF
DIFFERENT WAYS OF PERFORMING
THE FUNCTION.

THE ONLY WAY OF IMPROVING
A PERSON'S ABILITY TO GENERATE
THIS QUANTITY OF IDEAS IS TO
DEVELOP HIS CREATIVE BEHAVIOR

Thus, "Creative Thinking" is a key element in a Value Analysis effort.

The timing of Miles' investigations fortunately coincided with the development, by Alex Osborn, of a new technique of Creative Problem Solving called "Brainstorming" (First published in "Your Creative Power", Scribners, 1948). In attempting to apply brainstorming to "technical" problems such as those of

Engineering and Industrial Management, rather than Osborn's original "motivational" problems in advertising and sales promotion, there had been many failures. Technical people distrusted it. It smacked too much of singing commercials.

Miles saw in it, however, an ideal combination of conditions for implementing the second step of his Job Plan, the Speculative Phase.

His successes, together with the refinement and verification of the method by behavioral scientists, during the period 1955 to 1966, has completely removed the "Madison Avenue" stigma, and legitimized Brainstorming as a tool of engineering and management.

Why does it work?

1) JUDGEMENT IS DEFERRED. WHILE THE "CREATIVE MIND" IS AT WORK, THE "JUDICIAL MIND" IS SHUT OFF

(If we judge ideas as they arise, very few survive the ordeal. ---Note, however, that the judgement is merely deferred for the moment, not suspended. After the ideation is completed, judgement must be firmly reapplied.)
(In addition to deferring "internal" judgement, it is also necessary to defer, for the same reasons, outside criticism. It, too, must later be reapplied.)

2) THE "MENTAL CONTAGION", OR "CROSS-FERTILIZATION" OF IDEAS WHICH RESULTS WHEN SEVERAL PEOPLE ACHIEVE A TRUE "BRAINSTORM"

(Though Individual Brainstorming, based only upon the deferment of judgement principle is tremendously productive of ideas, a group of 2 to 5 people, ideally with different areas of specialization, is typically capable of generating 10 to 100 times the useful idea output of an individual. This occurs because the flow of ideas is constantly regenerated through combination, improvement, and "hitchhiking" of one idea upon others, and further, the different frames-of-reference of the participants will develop a "bridge" as a result of the Judgement Deferment of the session, tremendously increasing the flow of ideas.)

NOTE

It should be emphasized that achieving the state of group harmony which is required in order for mental contagion to operate requires:

1) Receptive participants
2) Motivation
3) Practice

In a Value Analysis Creative Session, the concepts of JUDGEMENT DEFERMENT and MENTAL CONTAGION are supplemented by three rules:

THE OBJECTIVE IS QUANTITY

(Behavioral research has proven that as the quantity of ideas builds, the quality of ideas being generated also increases. Thus the ultimate objective is QUANTITY FOR THE SAKE OF QUALITY.)

FREE-WHEEL

("Turn your mind on and let it go." "Say anything that comes into your mind." "The wilder the idea the better." The offbeat, obviously impractical ideas often "trigger" ideas in others.)

COMBINE, IMPROVE

(Here the individual brainstormer, by reviewing his ideas, develops logical relationships which regenerate his ideation on branching paths, but here also is the true value of a group brainstorming session.

"Looking over the list" to see how ideas might complement or supplement each other is an ideal "melting pot" or meeting place for different disciplines.)

COST TARGETING

The establishment of Production Cost Targets as part of an R & D effort is standard operating practice in every commercially-oriented business.

It has recently become a necessity in the production of Military materiel also. The reason for this change in approach is a radical change in policy which DOD initiated in 1962, wherein CPFF contracts were, to all intents, eliminated, and replaced by FFP contracts.

This simply means that we effectively quote to the customer a "budgetary" figure for production quantities to be shipped 2 to 4 years hence, before we have even determined the firm design concept. This "budgetary" figure often comes back to haunt us since the Government looks with extreme disfavor upon any later firm quotation which exceeds the original budgetary.

This environment is a new one to most experienced aerospace and military equipment design groups.

The historical criteria for a successful design effort were three: (In order of decreasing weight):

(1) PERFORMANCE. Does it work? If not, our effort is a failure.

(2) DELIVERY. Are the prototypes ready for the customer when we promised? If not, we get a black mark – plus an extension on our original delivery date.

(3) COST. Did we overrun on development cost? If so, we can attempt to recover from the Government, or we can invest "Company money" toward later production hopes.

The new climate demands that we add a fourth criteria:

(4) PRODUCTION ITEM COST. Is the design effort oriented toward developing an item which will sell in a competitive market? If not, our profit position on the later production contract is greatly weakened.

The required accommodation to changed conditions can be brought about, very simply, by adding item (4), weighted equally with PERFORMANCE, to the other three as the measures of accountability for each person contributing to the design. Very simply, by establishing COST TARGETS.

The procedure:

(1) As an adjunct to the first Design Review meeting, (SYSTEM CONCEPT REVIEW), a cost-target team is assigned by the Project Engineer.

(2) The team includes the following people or their designees:

1) Lead Electrical Engineer
2) Lead Product Design Engineer
3) Senior Buyer
4) Lead Manufacturing Engineer
5) Cost Control Accountant
6) Value Engineer

(3) The team will meet regularly, reporting written status weekly to the Project Engineer.

(4) Within a time limit set by the Project Engineer, the team will deliver to him the following:

1) A System Functional Block Diagram, detailed to one level above the component level.

2) Manufacturing Cost Targets assigned to each block and totaled forward for each level, based upon a production quantity and schedule specified by the Project Engineer with the concurrence of the Manager of Sales.

This data will be used by the Project Engineer as a control upon each person contributing to the design.

DOD INCENTIVES

The ARMED FORCES PROCUREMENT REGULATIONS (ASPR) control the purchase of $50,000,000,000 in materiel and services for the Department of Defense.

The ASPR were revised, on October 9, 1964, by DEFENSE PROCUREMENT CIRCULAR 11 (DPC-11), which added Part 17, covering Value Engineering in all DOD contracts.

The keynote to this remarkable document is covered in 1-1703.1(b) "...It is Department of Defense policy to be generous in sharing Value Engineering savings so long as they are definite cost reduction savings..."

Comments to clarify prevailing misunderstandings:

FACT

THE VE INCENTIVE SHARING PROVISIONS ONLY APPLY WHERE THE CUSTOMER'S PERMISSION MUST BE OBTAINED IN ORDER TO MAKE A CHANGE.

(Obviously, where the customer does not require this prior approval, we don't share a thing. It's all ours.

In the past, however, we found that if a change could be made which would lower our costs while not affecting performance, but it required a change in the contract specs or drawings, WE INVARIABLY DID NOT EVEN CONSIDER SUBMITTING IT, because there was little chance that the customer would approve it, because, in turn, there was no benefit to him to lowering our cost.

As a matter of fact, the customer would usually require that, as a condition of change approval, we lower our price to reflect our cost saving, thus removing our incentive for submitting the change in the first place.

DPC-11 provides a middle-ground.

The customer stands to save 50% of the cost reduction, so he is eager to approve any technically feasible change.

We get 50% of the cost reduction so we are motivated to investigate and submit the request for change. Note that $1 of this kind of money is worth $10 to $15 in sales.)

FACT

THE ADDITION OF ONE OF THE VE INCENTIVE SHARING CLAUSES SHOWN IN DPC-11 TO ANY FIXED PRICE CONTRACT CAN NOT POSSIBLY INJURE EITHER PARTY.

(If changes are not submitted pursuant to it, it merely lies there waiting. It confers no additional rights upon the customer, nor any obligations upon the contractor.

If it is in the contract, the contractor has an option to "use" it. If it is not in the contract, the contractor obviously loses this option.)

FACT

DOD ENCOURAGES US TO PUT VE INCENTIVE CLAUSES IN OUR SUBCONTRACTS TO VENDORS, BY ALLOWING US TO COUNT SUBCONTRACTORS' SHARING AS PART OF OUR IMPLEMENTATION COST.

(We are obviously motivated to negotiate sharing incentive clauses with our suppliers.)

FACT

DOD'S INTEREST IS IN SAVING MONEY ON THE TOTAL COST. THEY WILL ALLOW INCREASES IN OUR COST IF THE ULTIMATE USE COST OF THE ITEM IS LOWERED.

(We may thus share in savings to the Government in costs of operation, maintenance, GFE and logistic support.)

FACT

DOD WILL SHARE WITH US THE SAVING RESULTING FROM VE CHANGES ON PRESENT CONTRACTS, BUT MUCH MORE, THEY WILL ALSO SHARE WITH US THE SAVINGS RESULTING FROM USE OF THOSE CHANGES ON FOLLOW-ON PRODUCTION, WHETHER PRODUCED BY US OR BY ANOTHER COMPANY.

(These "Royalties" should further motivate our efforts, particularly when the change cannot be implemented until nearly the end of our production run.)

If the contract contains a VE Savings-Sharing Incentive Clause, it is to the great advantage of LFE that all VE-trained personnel make every effort to generate Value Engineering Change Proposals (VECPs) on any VE Cost Reduction which requires customer change approval.

An initial phase of any such effort must be a review of each specification. Typically, a production contract refers to 1000 pages of formal specification, plus thousands of drawing notes. It is not uncommon that the deletion or slight change of one sentence can eliminate thousands of dollars of unnecessary cost.

An intriguing statistic:

THERE ARE PRESENTLY 35,000 GOVERNMENT SPECIFICATIONS.
50% OF THEM ARE MORE THAN SEVEN YEARS OLD.

This initial review should be continued, and expanded to cover all elements required by the contract, throughout the contract life.

This is in keeping with that most basic of Value Analysis philosophies:

CHALLENGE EVERYTHING

LFE VALUE ENGINEERING WORKBOOK (SHORT FORM)

PROJECT NO. VE- 1 -

DEPT. NO. _____

SYSTEM NAME & NO. _____

PART NAME & NO. _____

FUNCTION _____ (VERB) _____ (NOUN)

RELATED DRAWINGS _____

SPECIFICATIONS _____

VENDOR(S) _____

KEY CUSTOMER REQUIREMENTS _____

_____

PRESENT MFG. COST EA _____ QTY/SYSTEM _____

QTY. ON ORDER _____ $ VALUE _____

DELIVERY SCHEDULE _____

FUTURE ORDERS _____ $ VALUE _____

_____

COMMENTS & SKETCHES

_____

DATE _____ 19____

INVESTIGATORS NAMES

_____

_____

_____

_____

_____

IMPLEMENTATION RESPONSIBILITY

KEY: _____

_____

_____

_____

CUSTOMER APPROVAL REQUIRED FOR CHANGE? ☐ YES ☐ NO

INFORMATION PHASE

WHAT IS IT?

WHAT DOES IT DO? — FUNCTION EVALUATION

WHAT DOES IT COST? — COST EVALUATION

SPECIAL EVALUATIONS — FUNCTION / COST

NO.	NAME, DRAWING NO. AND VENDOR — TOP ASSEMBLY	QTY	FUNCTION VERB	FUNCTION NOUN	BASIC	2ND DEG.	FUNCT. VALUE	FUNCTION VALUE BY COMPARISON WITH:	COST PER ASSEMBLY LABOR	OVERHEAD	MATERIAL	TOTAL	COST/YEAR	COST/POUND	COST PER FUNCTIONAL AREA				COST/DIMENSION	SCIENTIFIC EVALUATION OF FUNCTION COST/PROPERTY
1		1			✓														PER	PER
2																			PER	PER
3																			PER	PER
4																			PER	PER
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6																			PER	PER
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NOTE! TOTAL COLUMNS TO TOP OF PAGE ——— SHADED AREA IS FOR SECOND LEVEL ITEMS ONLY ——— CLEAR AREA IS FOR EVALUATING THE TOP ASSEMBLY ONLY

SPECULATIVE PHASE

WHAT ELSE WILL DO THE JOB? — LIST ALL IDEAS

CREATE! — DEFER ALL JUDGEMENT

1		16	
2		17	
3		18	
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14		29	
15		30	

BRAINSTORM RULES

1. DEFER JUDGEMENT
2. CRITICISM IS RULED OUT
3. FREE WHEELING IS WELCOMED
4. QUANTITY IS WANTED
5. COMBINATION AND IMPROVEMENT ARE SOUGHT

31		46	
32		47	
33		48	
34		49	
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36		51	
37		52	
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45		60	

STAPLE ALL PERTINENT DATA HERE (SKETCHES, NOTES, ESTIMATES, QUOTATIONS, LETTERS, ETC.)

ANALYTICAL PHASE

WHAT WILL THAT COST?

IDEAS FROM CREATIVE POOL OF POSSIBLE SOLUTIONS

NO.	BEST POSSIBILITIES	EST. COST	RANK	ADVANTAGES	DISADVANTAGES	RANK
1						
2						
3						
4						
5						

SUMMARY PHASE

FINAL SELECTION

NO.	DESCRIPTION	EST. COST	EST. SAVINGS PER UNIT	INVESTIGATION RESPONSIBILITY

PROGRAM EXECUTION PHASE

NON RECURRING COSTS		
	HRS	$
DESIGN		
DRAFTING		
EVALUATION		
MODEL SHOP		
PUBLICATIONS		
TECH LABOR		
TOOL DESIGN		
TOOL FAB		
MFG. METHODS		
MISC		
TOTAL		(C)

NOTES:

	DIRECT MATERIAL	DIRECT LABOR	VARIABLE PORTION OF OVERHEAD	TOTAL VARIABLE COST PER PIECE
PRESENT COST				(A)
PROPOSED COST EST				(B)

NET SAVINGS

1. DIFFERENCE IN VARIABLE COST (A MINUS B) _____
2. TOTAL NUMBER OF PIECES _____
3. TOTAL GROSS SAVINGS (1X2) _____
4. LESS: NON-RECURRING COSTS (C) _____
5. NET SAVINGS _____

COMPLETED BY _____ DATE _____ 19 ____

TO BE SUBMITTED TO _____

CHECK ONE ☐ VARIATION ☐ DEVIATION

IMPLEMENTATION

REA NO. _____ DATE _____

ECO NO. _____ DATE _____

"Value Analysis/Value Engineering is a MANAGEMENT TECHNIQUE.

A VA project is performed by a Value Analyst.

But, being a horizontal discipline, it must be empowered by MANAGEMENT.

And its findings can have no effect unless they are utilized by MANAGEMENT."