AD-A162 780 BUILDING COMMUNICATIONS-ELECTRONICS DATA BASES FOR CER (COST ESTIMATING R (U) MANAGEMENT CONSULTING AND RESEARCH INC FALLS CHURCH VA G R KREISEL 20 SEP 85 1/1

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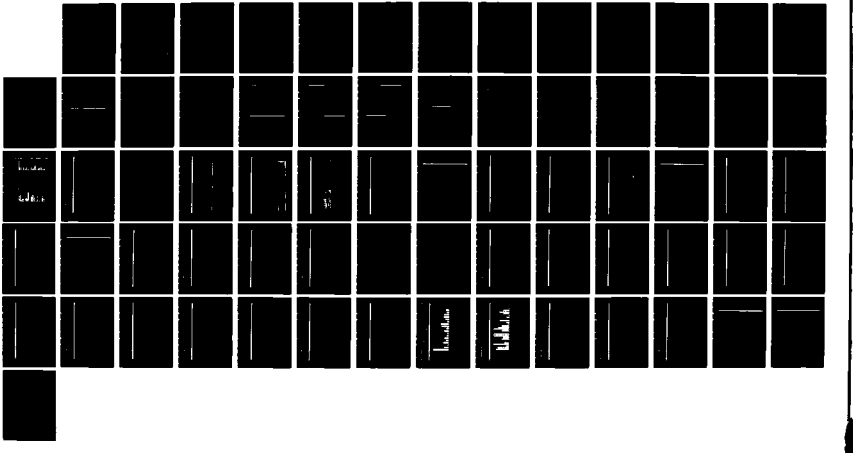

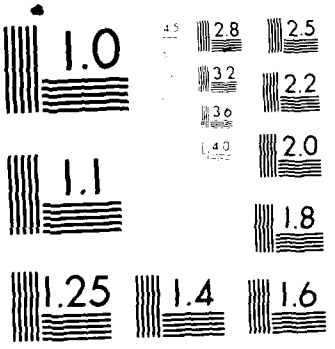

Contract No. DAAK-21-84-C-0087

Building Communications-Electronics Data Bases For CER Development

by

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BUILDING COMMUNICATIONS-ELECTRONICS DATA BASES FOR CER DEVELOPMENT

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ABSTRACT

This paper describes several related contractual efforts for the U.S. Army by Management Consulting & Research, Inc. (MCR) to build communications-electronics data bases for developing cost estimating relationships (CERs) and studying cost drivers. The evolutionary process of these efforts from raw to normalized cost and technical data is reviewed. The development of a generic work breakdown structure, enhancement of the Army's cost breakdown structure, and creation of a standard data format are discussed. The development of a user-friendly data base management system for storage and retrieval of data for CER development is described. Potential for a combined data base of over 165 systems and 400 generic components is discussed.

BUILDING COMMUNICATIONS-ELECTRONICS DATA BASES FOR CER DEVELOPMENT

BACKGROUND

In 1982, the Army initiated a cost research program to improve the data and methodology for cost analysis and estimation of Army programs. These improvements included data base development, cost estimating relationship (CER) development and other improved cost methods and techniques. The initial efforts concentrated on the development of historical data bases for study of cost drivers and development of CERs.

Management Consulting & Research, Inc. (MCR), a small business firm specializing in resource analysis, was awarded the first of these competitive contracts to develop a communications cost and technical data base for the Comptroller of the Army Cost Analysis Directorate. The following year, MCR won a second competitive contract to develop a fully normalized electronics cost data base for Hq Electronics Research and Development Command (ERADCOM). One year later MCR was awarded two additional contracts to expand and enhance both of these data bases.

This particularly fortuitous set of circumstances enabled MCR to develop two comprehensive and fully compatible historical cost and technical data bases for the U.S. Army. The ERADCOM Cost History and STatistical Analysis/Research System (TECH

STARS) and the COMMunications Equipment Data Base and STatistical Analysis/Research System (COMM STARS), contain data on over 400 generic components that can be used to develop CERs useful to both the communications and electronics areas.

Communications Equipment Data Base (CEBD)

MCR's initial effort was performed for the Comptroller of the Army Cost Analysis Directorate in cooperation with Hq Communications-Electronics Command (CECOM). The contract called for MCR to collect cost, program, physical and performance characteristic data on 30 communications systems. (Data were delivered on 46 systems.) The data were standardized to the extent possible without compromising the value as raw source data and formatted and entered into two computer systems. The data bases reside on a Tektronix 4054 computer in the Pentagon in Washington, D.C. and on an HP 9845C computer at CECOM in the Hexagon at Ft. Monmouth, New Jersey. User-friendly data base management systems (DBMS) were programmed for both computers to permit entry, update and retrieval of data. Data is retrieved in the form of system summaries which give all available data on the requested system.

The ERADCOM Cost History And Statistical Analysis/Research System (TECH STARS)

MCR's efforts for Hq ERADCOM went considerably beyond the CEDB concept. MCR collected cost, program, physical and performance characteristic data on 52 electronic (non-communications)

systems. The data were adjusted, formatted and normalized into standard data sets that can be used in various combinations for CER development. The data base resides on a classified PRIME 750 computer at Hq ERADCOM, Adelphi, Maryland. MCR programmed a user-friendly DBMS, in the INFO language, that permits changing or adding data, retrieval of system summaries, retrieval of data samples ready for CER development, searches for systems or components in any category, searches for contractor information, printing of reference tables for the work breakdown structure (WBS) or cost breakdown structure (CBS), and numerous other features. Hq ERADCOM cost analysis personnel have developed CERs for specific applications. They routinely supply program managers or other laboratory personnel with system summaries.

TECH STARS Enhancements

MCR is completing a number of enhancements to the ERADCOM electronics data base under a follow-on contract. The enhancements include increasing the number of system and component cost matrices contained in the data base by adding data on 37 new systems, and developing a data tracking methodology for Hq ERADCOM to use in keeping TECH STARS up-to-date.

As part of the TECH STARS enhancements, MCR is making DBMS improvements. Chief among these is the addition of another file that can be retrieved for analysis by the statistical analysis/research program. This file will be formatted specifically for cost-to-cost CERs.

Another innovation in the TECH STARS enhancements will be the addition of data obtained on component spares. MCR developed techniques to collect component spares costs from existing Army information systems, obtain procurement history and technical data, and normalize the data to be consistent with that existing in TECH STARS. This helped overcome the limitations on the amount of component data available directly from cost reports and contracts.

CEDB Enhancements (COMM STARS)

MCR is also currently completing a competitive contract to enhance the existing CEDB for the Comptroller of the Army Cost and Economic Analysis Center (CEAC), formerly Cost Analysis Directorate. This is a major upgrade of the CEDB into COMM STARS with collection of data on 30 new systems and normalization of all data to be ready for CER development. The normalization of the data was done using the procedures generated for TECH STARS. The resulting COMM STARS will be fully compatible with TECH STARS which will permit the two data bases eventually to be combined. This combined data base would provide much larger data samples for component CER development.

The data are arranged in the same data format as TECH STARS and entered into IBM PC-compatible micro-computers with 10 megabyte hard disk drives. One computer will reside at the CEAC in the Pentagon and the other at CECOM, Ft. Monmouth. As soon as

the INFO relational DBMS became available for IBM PCs, MCR obtained copies for the Army and downloaded ERADCOM's TECH STARS program (in INFO) for use by CEAC and CECOM. The program, used with the communications data base, is referred to as COMM STARS. Additional programming was required to interface the DBMS with the commercial statistical analysis program that was used for COMM STARS.

MCR is developing preliminary communications system CERs under this contract using COMM STARS. This is the first application of the COMM STARS data base, CER file retrieval routines, and regression analysis programs to develop CERs.

DESCRIPTION OF DATA BASES

The data contained in the COMM STARS and TECH STARS data bases are different, but the data formats are identical. The computers on which the data bases reside are different, but use the same user-friendly DBMS. The file structure of the two data bases are the same so that data could be transferred between them. The following description of the data bases can apply to either COMM STARS, TECH STARS, or both.

The data base structure is represented pictorially in the overview of Exhibit 1. The data base contains actual historical costs on systems, subsystems, components and subcomponents. The costs have been formatted to conform to a standardized CBS and

hardware/software WBS. The costs have been adjusted so that the data points are comparable for developing CERs. The costs have been normalized to FY83 constant dollars.

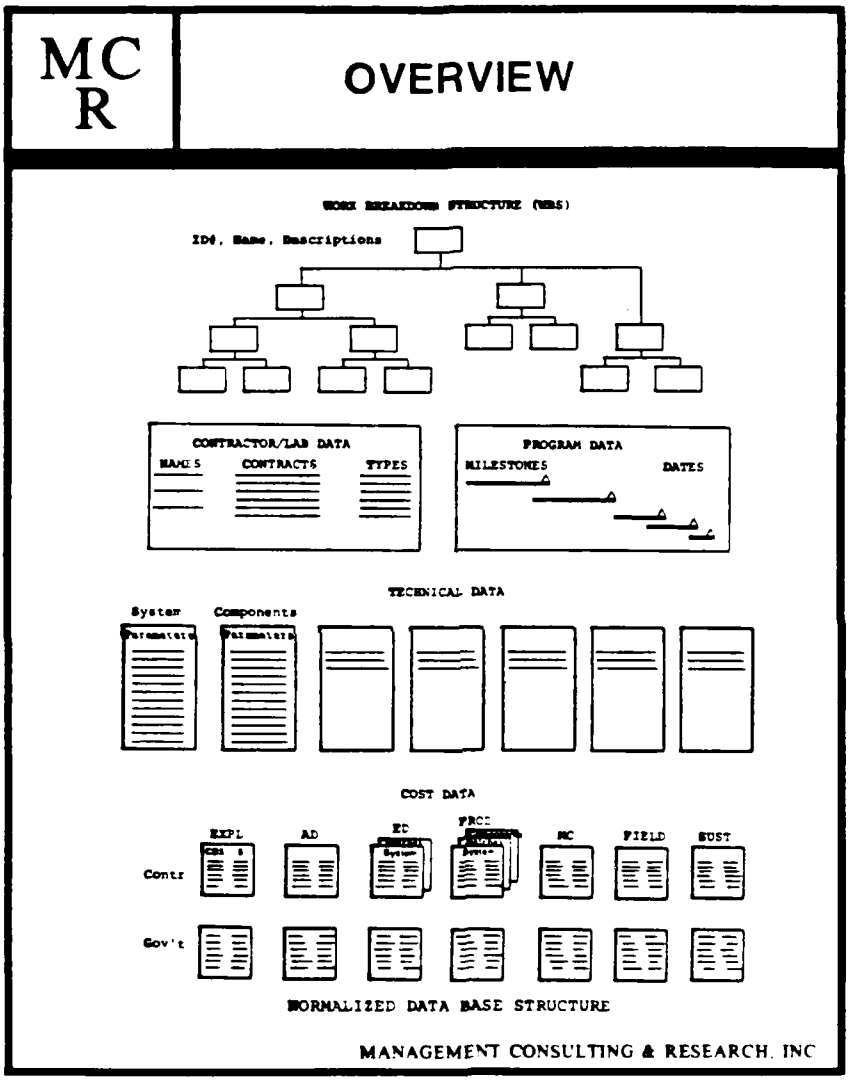

Exhibit 1

Program data, consisting of milestone dates for program phases, Service sponsors and Initial Operational Capability (IOC) dates are included for each program represented in the data base. Contractor/Lab data identifies the contractors and/or Government

laboratories that developed or manufactured each system in the data base. Contract numbers and types for all systems are included.

A hardware/software WBS (family tree) for each system is entered in the data base. This identifies the generic systems and components on which data are retrievable for CER development. Standard lists of technical parameters are provided for each generic system or component corresponding to its category.

Footnotes accompany and supplement the data. Peculiarities of programs, contracts, equipment, costs or parameters are explained so that the cost analyst can make an informed decision about the appropriateness of each data point retrieved.

The objective of the COMM STARS or TECH STARS DBMS is to permit extraction of data according to generic system or component categories, and transfer files to a statistical analysis/ research program for development of CERs by regression analysis. The concept is illustrated in Exhibit 2. The diagram depicts a search of the data base for data on the desired common component, a power supply. The data file is then transferred for analysis and development of a CER for use in a cost estimate. The selection of generic component categories thus permits the selection of component data across the boundaries of the systems. The data samples are thereby enlarged and CER development enhanced.

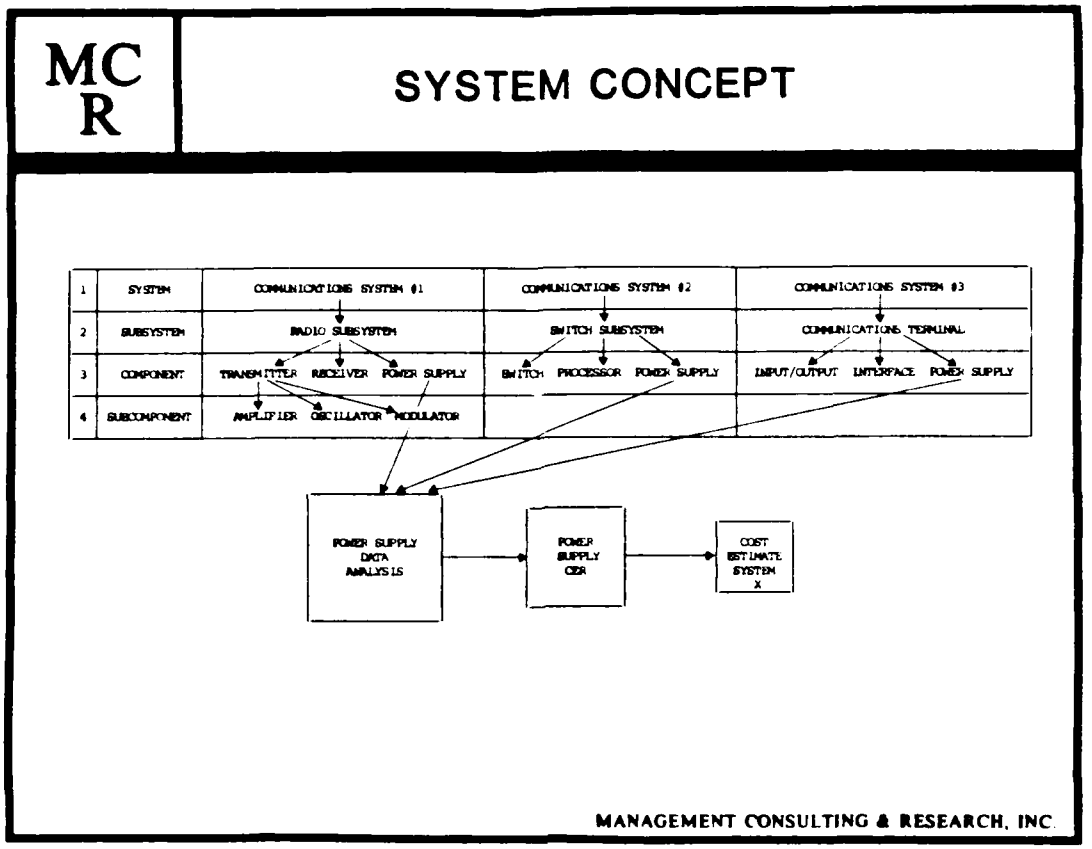

Exhibit 2

CECOM communications systems in COMM STARS are divided into seven equipment categories. ERADCOM electronics systems in TECH STARS are divided into 17 equipment categories, but the data collection was concentrated on the 11 categories of major interest to Hq ERADCOM cost analysts. There is no overlap in system categories between the two data bases.

COMM STARS and TECH STARS share 25 generic component categories. There are five additional component categories that apply only to the electronics equipment in TECH STARS. Exhibit 3 illustrates the system and component categories of the two data

bases. The potential for enlarged data samples for generic component CER development by combining the data bases is apparent.

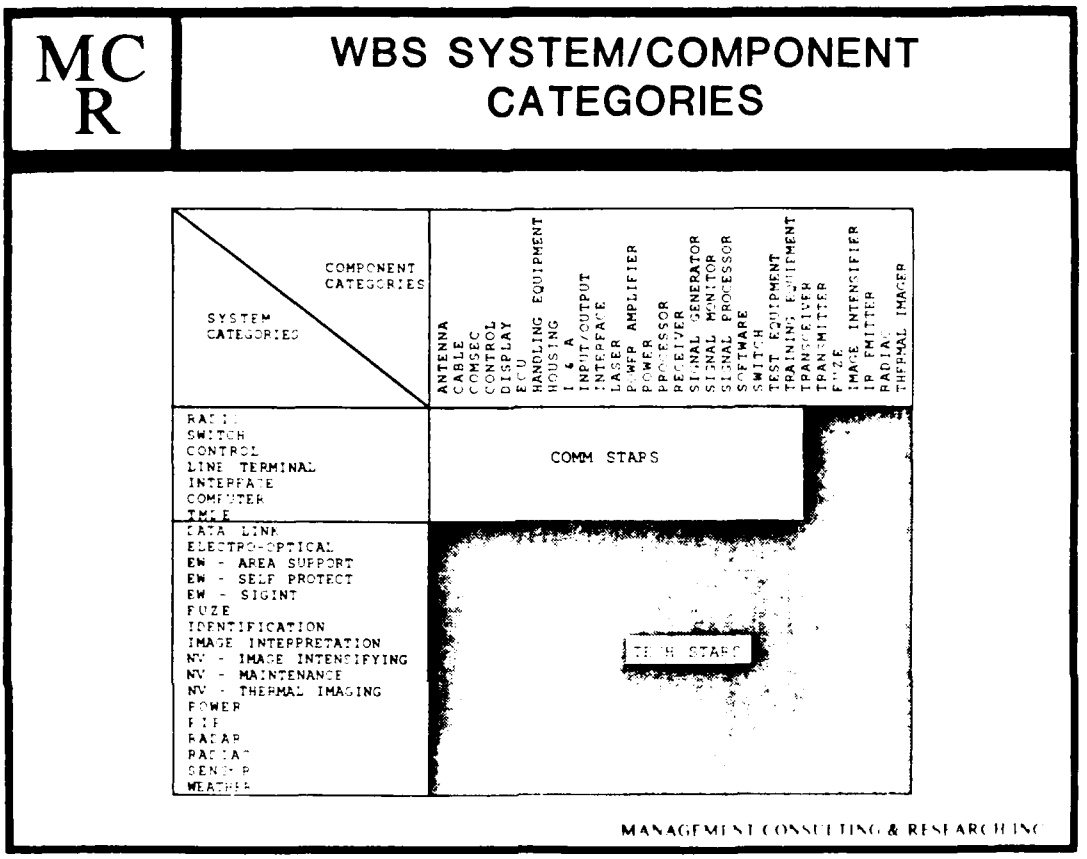

Exhibit 3

The COMM STARS/TECH STARS CBS is illustrated in Exhibit 4. This conforms to the Army CBS for baseline and independent cost estimates -- with some modifications that are shown shaded in the exhibit. MCR designed the modifications to be transparent to cost analysts who were using the Army CBS, while meeting peculiar requirements of the data bases. One of these requirements was to put all data elements on a cost basis, rather than price. G&A,

fee, and other contractor burden were used to calculate cost in those cases where the raw data was at the price level. These new cost elements became subdivisions of "OTHER" cost. The raw data is thus preserved in the data base, and all assumptions and adjustments are footnoted. The other requirement was for summary level cost elements useful for cost-to-cost CER formulation. These summary elements can be identified by the "S" in their CBS Number.

MCR	COST BREAKDOWN STRUCTURE

FUND APP	CBS NO.	COST ELEMENT
RD	1.0	DEVELOPMENT
RD	1.01	DEVELOPMENT ENG
RD	1.011	ENGINEERING
RD	1.012	PROD ENG. & PLAN (PEP)
RD	1.013	TOOLING
RD	1.014	PROTOTYPE MANUFACTURE
RD	1.02	DATA
RD	1.03	SYSTEMS TEST & EVAL
RD	1.04	SYS/PROJ MGMT
RD	1.05	ILS TRAIN. SERV & EQ
RD	1.06	FACILITIES
RD	1.07	OTHER RDT&E FUND DEV
RD	1.071	OTHER RDT&E COST
RD	1.072	CONTR G&A
RD	1.073	CONTR FEE
RD	1.074	OTHER CONTR BURDEN
RD	1.S1	DEVEL SUPPT (ST 1.02-1.071)
RD	1.S2	DC + OH (ST 1.01-1.071)
RD	1.S3	CONTR MARKUP (ST 1.072-1.074)
PR	2.0	PRODUCTION
PR	2.01	NON-RECURRING PROD
PR	2.02	RECURRING PRODUCTION
PR	2.021	MANUFACTURING
PR	2.022	RECURRING ENG
PR	2.023	SUSTAINING TOOLING
PR	2.024	QUALITY CONTROL
PR	2.03	ENGINEERING CHANGES
PR	2.04	DATA
PR	2.05	SYSTEM TEST & EVAL
PR	2.06	ILS TRAIN. SERV & EQ
PR	2.07	INITIAL SPARES
PR	2.08	OPERAT/SITE ACTIV
PR	2.09	OTHER PROC FUND PROD
PR	2.091	OTHER PRODUCTION COST
PR	2.092	CONTR G&A
PR	2.093	CONTR FEE
PR	2.094	OTHER CONTR BURDEN
PR	2.S1	PROD SUPPT (ST 2.04-2.091)
PR	2.S2	DC + OH (ST 2.01-2.091)
PR	2.S3	CONTR MARKUP (ST 2.092-2.094)

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Exhibit 4

METHODOLOGY

MCR conducted extensive data collection efforts for these data bases, searching Department of Defense, Service and contractor sources for the required data. The bulk of the cost data was obtained from contracts and contract modifications. Contractor Performance Reports (CPRs) were better sources, but the number obtained was small. Technical/functional data was obtained from performance specifications, technical manuals, program briefings and similar sources. Program information was obtained primarily from interviews with project leaders. Contract histories were obtained from contract files or archives.

The raw cost data required long and tedious formatting, adjustment, and normalization before it was ready for input into the COMM STARS or TECH STARS data bases. A Chart-of-Accounts, eight pages long, was developed to aid the analysts in cross-walking cost elements from contracts or cost reports to the COMM STARS/TECH STARS CBS elements. A computer program was used to aid in this cross-walk. A computer spreadsheet was developed to perform the normalization to constant dollars. For programs where expenditure profiles were not available, the spreadsheet program computed typical profiles based on other programs in the data base. A series of data adjustment and data entry forms were designed to aid the analyst, promote uniformity, and enforce thorough documentation of all adjustments made. Learning curves were computed for recurring costs.

Work breakdown structures for each system were constructed. Technical parameters were extracted and entered on standardized data sheets. One of these technical data sheets was created for each generic system and component to insure absolute comparability of data points for CER development.

SYSTEM OPERATION

Exhibit 5 illustrates the data entry into the COMM STARS/ TECH STARS data bases and its subsequent retrieval. The

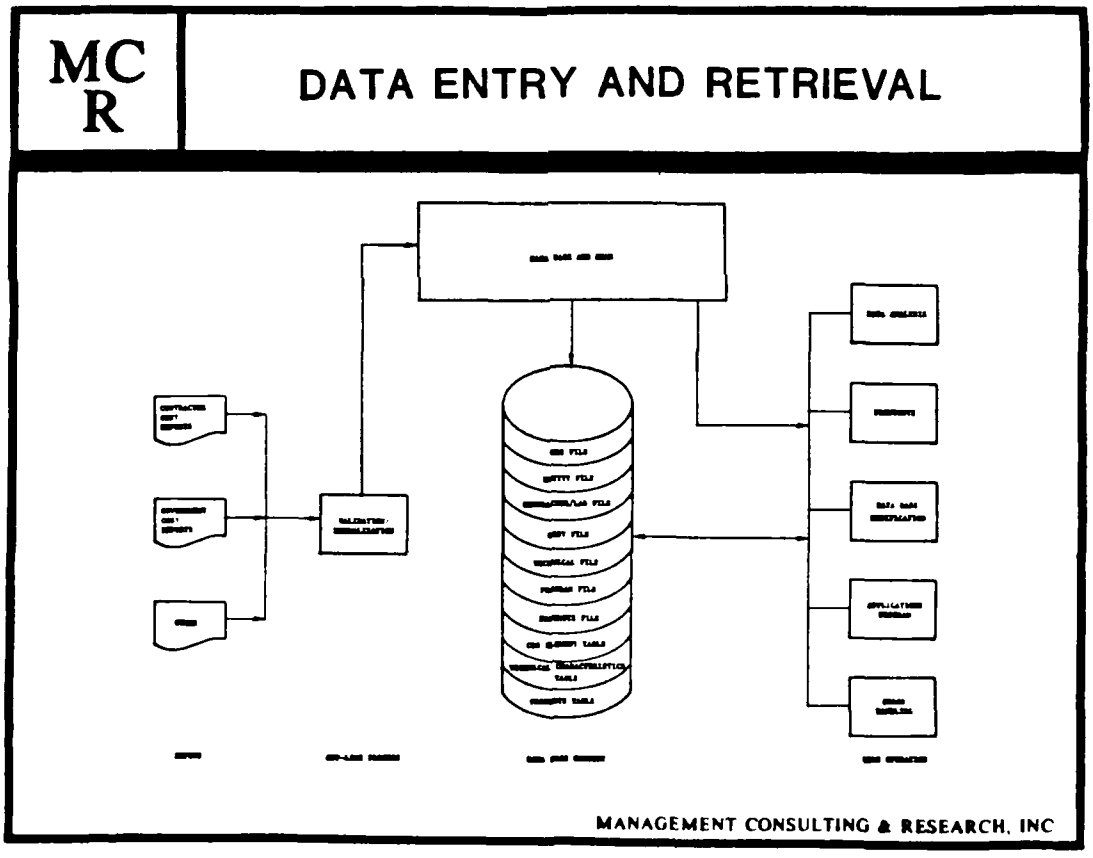


Exhibit 5

user-friendly DBMS prompts the user to enter the data by forms -- corresponding to the data sheets resulting from the formatting, adjusting and normalizing process. The data is stored in appropriate files. The DBMS, through a statistical analysis program, permits complete analysis of data that is retrieved from the files in a form ready for CER development. Other application programs can be incorporated into the DBMS structure as well.

The focus of the data bases is the capability to extract cost data and technical/functional parameters on all systems or components in the data base that are appropriate for a desired CER development. These data are presented in the form of cost/characteristic analysis files. Upon entry of the desired system or component, CBS element and program phase numbers, the DBMS will retrieve all relevant information. This includes:

- identification, nomenclature and description of each system or component selected;
- first unit and total costs in constant dollars, learning slopes, quantities, years and sources;
- identification of the system and the contractor or laboratory;
- program information on Service sponsor, phase start date, phase duration and IOC date;
- forty technical/functional parameters and their units of measure; and
- footnotes describing the system or component and noting any peculiarities in the equipment, cost, system, program or technical parameter values.

Selected pages of a typical cost/characteristic analysis file (for a radio system) are shown in Exhibit 6. The cost analyst, after retrieving a cost/characteristic analysis file for CER development, can perform gross editing by removing data points considered inappropriate to the analysis. The file then can be passed to the statistical analysis/research program where detailed editing and transformations can be performed prior to regression analysis. The file, as it appears in the COMM STARS statistical analysis spreadsheet, is shown in Exhibit 7. Results of the analysis can be printed out to document the CERs, the data sample and the regression statistics.

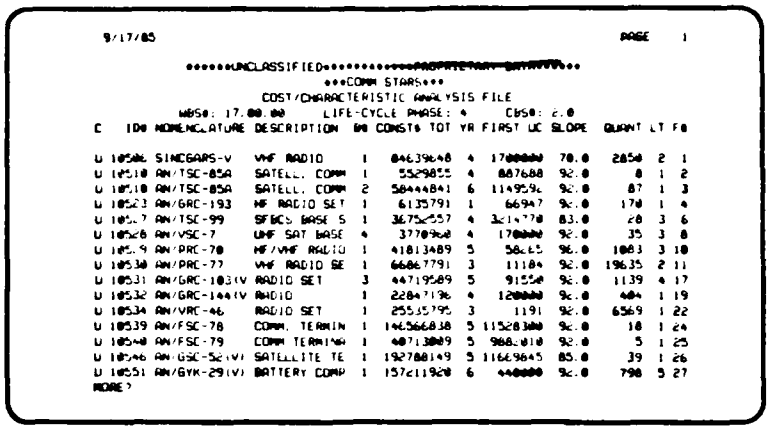
A new analysis file has been added to the DBMS to permit development of cost-to-cost CERs. This new file will be used in a similar manner to the cost/characteristic analysis file described above.

In addition to the analysis files, the user can retrieve all data on each system or component by requesting the appropriate report. These reports are:

- WBS Search listing all systems or components that correspond to the requested category;
- System Summary of a system which includes:
  - WBS linking the system, components and subcomponents;
  - program data giving milestone dates;
  - contractor/laboratory data listing contractors and contracts for the system;

MC R

ANALYSIS FILE



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******UNCLASSIFIED******

COMM STARS

COST/CHARACTERISTIC ANALYSIS FILE

WBS#: 17.00.00 LIFE-CYCLE PHASE: 4 CBS#: 2.0

C	ID#	NOMENCLATURE	DESCRIPTION	00	CONST$	TOT YR	FIRST UC	SLOPE	QUANT	LT	FB
U	10506	SINCGARS-V	VHF RADIO	1	84639648	4	17000000	70.0	2850	2	1
U	10510	AN/TSC-85A	SATELL. COMM	1	5529855	4	887688	92.0	8	1	2
U	10510	AN/TSC-85A	SATELL. COMM	2	58444841	6	1149596	92.0	87	1	3
U	10523	AN/GRC-193	HF RADIO SET	1	6135791	1	66947	92.0	170	1	4
U	10527	AN/TSC-99	SFBCS BASE S	1	36752557	4	3214770	83.0	28	3	6
U	10526	AN/VSC-7	UHF SAT BASE	4	3770968	4	170000	92.0	35	3	8
U	10529	AN/PRC-70	HF/VHF RADIO	1	41813489	5	58615	92.0	1883	3	10
U	10530	AN/PRC-77	VHF RADIO SE	1	66867791	3	11184	92.0	19635	2	11
U	10531	AN/GRC-103(V	RADIO SET	3	44719589	5	91554	92.0	1139	4	17
U	10532	AN/GRC-144(V	RADIO	1	2284796	4	120000	92.0	484	1	19
U	10534	AN/VRC-46	RADIO SET	1	25535795	3	1191	92.0	6569	1	22
U	10539	AN/FSC-78	COMM. TERMIN	1	1465668838	5	115283000	92.0	18	1	24
U	10540	AN/FSC-79	COMM TERMINA	1	407138089	5	9881010	92.0	5	1	25
U	10546	AN/GSC-52(V)	SATELLITE TE	1	192788149	5	11669845	85.0	39	1	26
U	10551	AN/GYK-29(V)	BATTERY COMP	1	157211920	6	440000	92.0	798	5	27

MORE?

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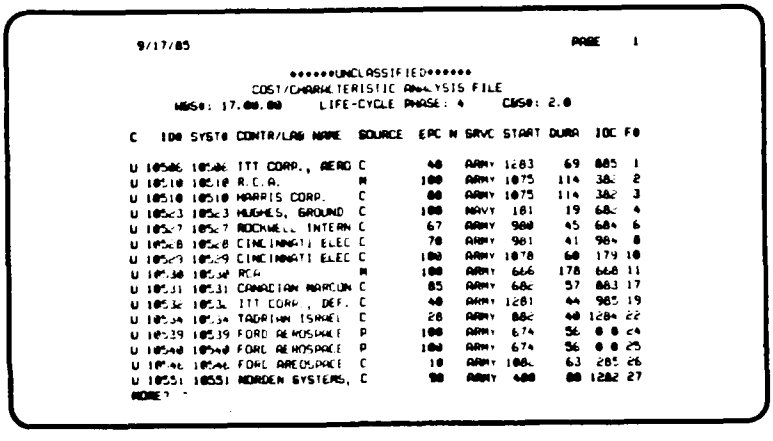
MC R

ANALYSIS FILE (CONT'D)



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******UNCLASSIFIED******

COST/CHARACTERISTIC ANALYSIS FILE

WBS#: 17.00.00 LIFE-CYCLE PHASE: 4 CBS#: 2.0

C	ID#	SYS#	CONTR/LAB NAME	SOURCE	EPC	N	SRVC	START	DURA	IOC	FB
U	10506	10506	ITT CORP., AERO	C	40		ARMY	1283	69	885	1
U	10510	10510	R.C.A.	M	100		ARMY	1075	114	388	2
U	10510	10510	HARRIS CORP.	C	80		ARMY	1075	114	382	3
U	10523	10523	HUGHES, GROUND	C	100		NAVY	181	19	684	4
U	10527	10527	ROCKWELL INTERN	C	67		ARMY	980	45	684	6
U	10528	10528	CINCINNATI ELEC	C	70		ARMY	981	41	984	8
U	10529	10529	CINCINNATI ELEC	C	100		ARMY	1078	60	179	10
U	10530	10530	RCA	M	100		ARMY	666	178	668	11
U	10531	10531	CANADIAN MARCON	C	85		ARMY	686	57	883	17
U	10532	10532	ITT CORP., DEF.	C	40		ARMY	1281	44	985	19
U	10534	10534	TADIRAN ISRAEL	C	20		ARMY	882	40	1284	22
U	10539	10539	FORD AEROSPACE	P	100		ARMY	674	56	0	0 24
U	10540	10540	FORD AEROSPACE	P	100		ARMY	674	56	0	0 25
U	10546	10546	FORD AREOSPACE	C	10		ARMY	1086	63	285	26
U	10551	10551	NORDEN SYSTEMS,	C	90		ARMY	480	80	1282	27

MORE?

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Exhibit 6

MCR

ANALYSIS FILE (CONT'D)

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******UNCLASSIFIED******

COST/CHARACTERISTIC ANALYSIS FILE

WBS#: 17.00.00 LIFE CYCLE PHASE: 4 CBS# 0.0

C	ID#	RECEIV CTR FREQ MHZ	RECEIVE BW MHZ	TRANSM CTR FREQ MHZ	TRANSMIT BW MHZ	F#
U	10500	59	29	59	29	1
U	10510					2
U	10510					3
U	10523					4
U	10527	16	14	16	14	6
U	10526					8
U	10529	39	37	39	37	10
U	10530	53	23	53	23	11
U	10531	1600	250	1600	250	17
U	10532	4700	300	4700	300	19
U	10534					22
U	10539	7500	250	8150	250	24
U	10540	7500	250	8150	250	25
U	10546	7500	250	8150	250	26
U	10551					27

MORE?

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MCR

ANALYSIS FILE (CONT'D)

9/17/85 PAGE 1

[redacted]

1 SINCGARS IS A FAMILY OF FREQUENCY HOPPING, VHF, FM RADIO.
SINCGARS WAS DEVELOPED TO OFFSET THE THREAT OF
SINGLE-FREQUENCY JAMMING TECHNIQUES THAT CURRENT
FIXED-FREQUENCY MANPACK AND VEHICULAR COMBAT NET RADIOS
ARE SUSCEPTABLE TO. SINCGARS IS DESIGNED TO HANDLE VOICE
COMMUNICATIONS AND NATO COMPATIBLE DATA TRANSMISSION AND
WILL PROVIDE THE PRIMARY MEANS OF COMMAND AND CONTROL FOR
INFANTRY, ARMOR, AND ARTILLERY UNITS.
START DATE SHOWN IS CONTRACT AWARD DATE.
CONTRACT NUMBER CHANGED FROM DAAB07-83-C-K561.
SINCGARS V WENT DIRECTLY FROM AD TO PRODUCTION PHASE.
DURATION FROM CONTRACT AWARD DATE THROUGH DATE OF LAST
SCHEDULED DELIVERY UNDER THIRD OPTION YEAR (4TH PROGRAM
YEAR). CONTRACT STILL OPEN AS OF 6/85.
FFP TOTALS WERE TAKEN FROM THE CONTRACT FOR EACH COST
ELEMENT. CONTRACTOR BURDEN COSTS WERE TAKEN OUT OF EACH
COST ELEMENT. EACH COST ELEMENT WAS THEN SPREAD AND
MORE?

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Exhibit 6 (Cont'd)

STATISTICAL ANALYSIS FILE

A0: IDNUMBER#   65512 READY

Type / for Command Menu

	A	B	C	D	E	F	G
Name	IDNUMBER#	BATCH#	CONSTTOT	#YEARS	FRSTUNIT	SLOPE	QUANTITY
1	10506	1	84639648	4	1700000	70	2850
2	10510	1	5529855	4	887688	92	8
3	10510	2	58444841	6	1149592	92	87
4	10523	1	6135791	1	66947	92	170
5	10527	1	36752557	4	3214770	83	20
6	10528	4	3770960	4	170000	92	35
7	10529	1	41813489	5	58265	96	1083
8	10530	1	66867791	3	11184	92	19635
9	10531	3	44719589	5	91550	92	1139
10	10532	1	22847196	4	120000	92	404
11	10534	1	25535795	3	1191	92	6569
12	10539	1	146566838	5	11528300	92	18
13	10540	1	40713009	5	9882010	92	5
14	10546	1	192788149	5	11669845	85	39
15	10551	1	157211920	6	440000	92	798
16	10579	1	4068114	5	60301	92	120
17	10580	1	2135192	5	67186	92	51
18	10589	1	92279443	9	54270	90	2176
19	10591	1	9279960	3	0	0	0

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STATISTICAL ANALYSIS FILE (CONT'D)

N0: RCVBW   65512 READY

Type / for Command Menu

	H	I	J	K	L	M	N
Name	SERVICE#	STRTDATE#	DURATION	IOC#	CLASS#	RCVFREQ	RCVBW
1	ARMY	1283	69	885	.	59	29
2	ARMY	1075	114	382	.		
3	ARMY	1075	114	382	.		.
4	NAVY	181	19	682	.		
5	ARMY	900	45	684	.	16	14
6	ARMY	901	41	904	.		
7	ARMY	1078	60	179	.	39	37
8	ARMY	666	178	660	.	53	23
9	ARMY	682	57	883	.	1600	250
10	ARMY	1281	44	905	.	4700	300
11	ARMY	882	40	1284	.		
12	ARMY	674	56		.		7500
13	ARMY	674	56		.		7500
14	ARMY	1082	63	285	.	7500	250
15	ARMY	480	80	1282	.		
16	ARMY	782	41	586	.	16	14
17	ARMY	782	56	586	.	16	14
18	ARMY	1276	108	778	.	13	325
19	AF	902	48	185	.	16	14

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Exhibit 7

- cost matrices for the system and its components; and
- technical/functional parameters for the system and its components;

- Contractor/Lab Search listing all contracts performed by the requested contractor or laboratory; and
- Parent ID Search which locates the system to which a component or subcomponent belongs.

Examples of a cost matrix and a technical parameter printout are given in Exhibits 8 and 9.

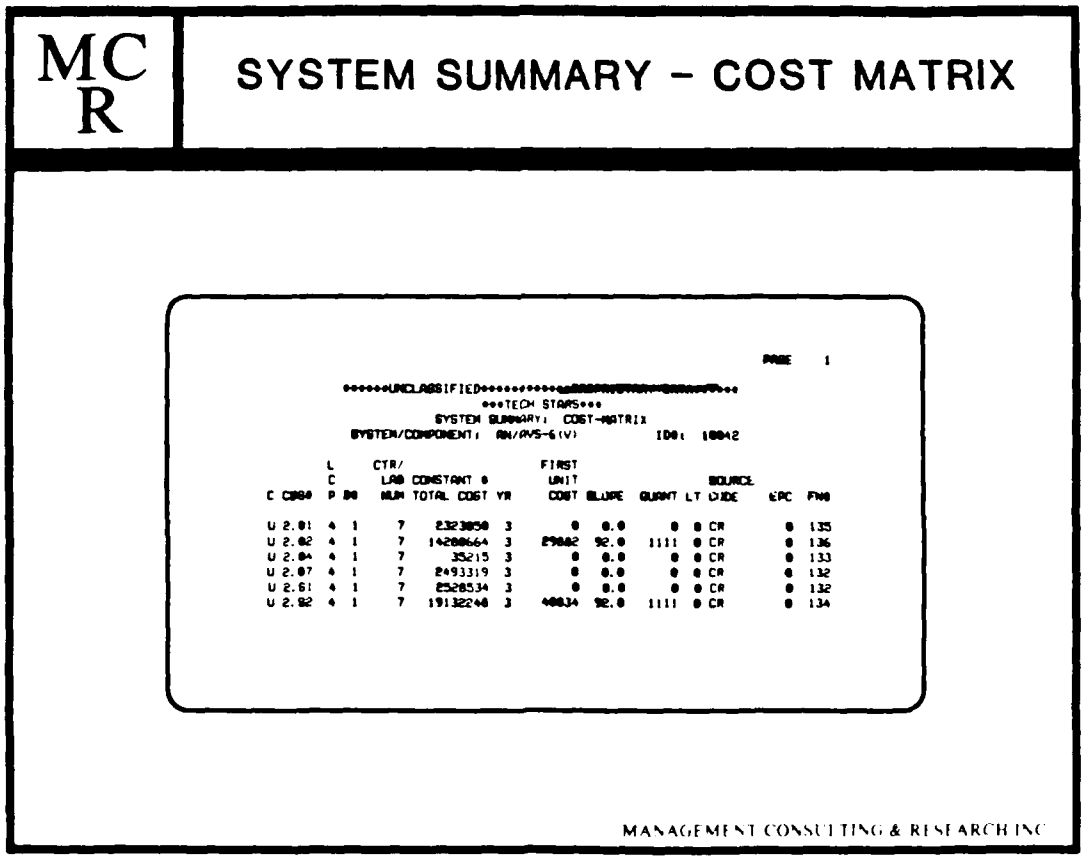
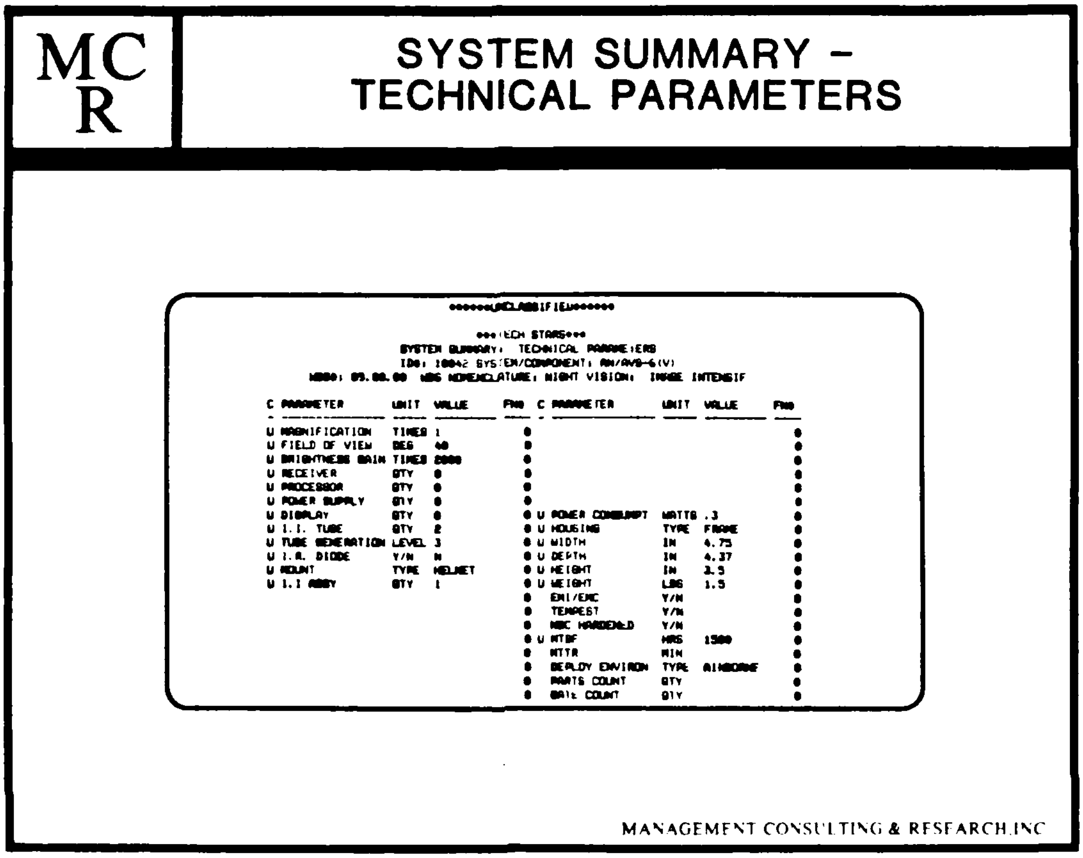


Exhibit 8



******UNCLASSIFIED******

TECH STARS
SYSTEM SUMMARY: TECHNICAL PARAMETERS
ID#: 10042 SYSTEM/COMPONENT: AN/AVS-6(V)
WBS#: 05.00.00 WBS NOMENCLATURE: NIGHT VISION: IMAGE INTENSIF

C	PARAMETER	UNIT	VALUE	FN	C	PARAMETER	UNIT	VALUE	FN
U	MAGNIFICATION	TIMES	1	●					●
U	FIELD OF VIEW	DEG	40	●					●
U	BRIGHTNESS GAIN	TIMES	2000	●					●
U	RECEIVER	QTY	●	●					●
U	PROCESSOR	QTY	●	●					●
U	POWER SUPPLY	QTY	●	●					●
U	DISPLAY	QTY	●	●	U	POWER CONSUMPT	WATTS	.3	●
U	I.I. TUBE	QTY	2	●	U	HOUSING	TYPE	FRAME	●
U	TUBE GENERATION	LEVEL	3	●	U	WIDTH	IN	4.75	●
U	I.R. DIODE	Y/N	N	●	U	DEPTH	IN	4.37	●
U	MOUNT	TYPE	HELMET	●	U	HEIGHT	IN	3.5	●
U	I.I ASSY	QTY	1	●	U	WEIGHT	LBS	1.5	●
				●		EMI/EMC	Y/N		●
				●		TEMPEST	Y/N		●
				●		NBC HARDENED	Y/N		●
				●	U	MTBF	HRS	1500	●
				●		MTTR	MIN		●
				●		DEPLOY ENVIRON	TYPE	AIRBORNE	●
				●		PARTS COUNT	QTY		●
				●		PART COUNT	QTY		●

Exhibit 9

To aid the user in his analysis, several references tables are available that can be called to the screen, or printed out in hard copy to be kept handy while operating the DBMS. These reference tables are:

- <u>WBS Element Tables</u> for:
  - equipment categories, and
  - component categories;

- CBS Element Tables for:
  - development,
  - production,
  - military construction,
  - fielding, and
  - sustainment;
- Footnotes; and
- Analysis File Names.

The addition or changing of data is limited to the Data Base Administrator (DBA) in order to assure the integrity of the data base. The DBA must enter the appropriate password to be able to have access to the update functions which are:

- entering data on a new system, component or subcomponent;
- changing data on an existing system, component or subcomponent;
- adding footnotes, and
- changing footnotes.

POTENTIAL APPLICATIONS

The data bases are government-owned, centralized, computerized data bases on communications and electronics equipment cost and technical data. As such, they can aid in a variety of analyses and decisions. Potential applications of these data bases might include:

- development of CERs for:
  - systems, and
  - components;
- development of cost-to-cost CERs for
  - non-recurring costs to recurring costs,
  - "below-the-line" costs to hardware costs, and
  - production costs to development costs;
- evaluation of cost drivers such as MILSPEC requirements, technical parameters, contract types;
- familiarity with system content to prepare the analyst for independent cost estimates;
- modeling new systems for cost estimating; and
- analysis of contract histories.

There is great potential for future evolution and growth of the COMM STARS/TECH STARS concept. These evolutionary steps might include:

- combining COMM STARS and TECH STARS into a single communications-electronics data base;
- addition of other related communications-electronics equipment categories, and
- expansion to include other Services and Agencies.

The combination of COMM STARS and TECH STARS would provide a single data base containing cost and technical data on over 165 communications-electronics systems. When the enhancement projects are completed this month (September 1985), the data bases will contain cost and technical data on over 400 functional components. Data on the generic components can be assembled across

the boundaries of their parent systems, greatly increasing the size of data samples for CER development. The combination of TECH STARS and COMM STARS into a single data base has become more imminent with the transfer of many ERADCOM laboratories to CECOM. Most of the systems in TECH STARS will become the responsibility of CECOM.

Other communications-electronics equipment could be added to the combined data bases in the future. Logical additions might include:

- navigation equipment,
- command and control systems; and
- missile electronics.

There is, of course, the possibility that the data base concept will be useful to other Services or Agencies. Certainly the Air Force and Navy have many related communications-electronics equipments that are not covered (although some systems from each Service are represented). If these Services were to implement the COMM STARS/TECH STARS DBMS in its current configuration, for their own data bases, then all resulting data bases could be effectively combined. Exhibit 10 illustrates such a concept. This would increase even further the number of systems and components available for CER development. Each Service, Command, or Agency could then maintain its own data base and periodically share the updates with the others via modem or tape transfer.

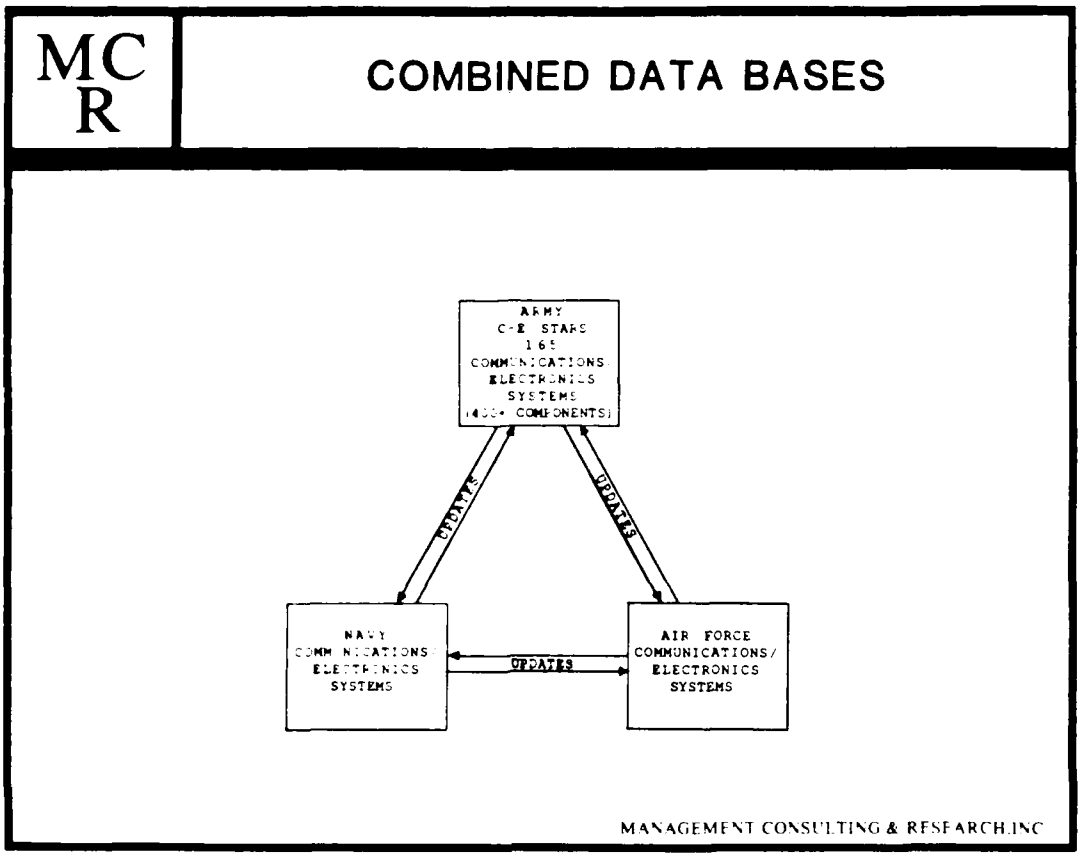


Exhibit 10

SUMMARY

MCR conducted a series of projects for the U.S. Army to develop the TECH STARS electronics equipment data base and the COMM STARS communications equipment data base. Both contain fully normalized cost, program and technical data in an automated system. Data can be retrieved in files ready for CER

development and passed to a statistical analysis program to generate CERs.

CERS can be generated on-line for either systems or major components. The data bases are currently programmed for either a PRIME 750 computer or an IBM PC-compatible micro-computer.

TECH STARS and COMM STARS share an evolutionary development process that resulted in nearly identical DBMSs, which manipulate different data bases. The generic component breakdown used in constructing the data bases permits using component data across system boundaries. This also permits the use of a combined data base for developing component CERs, further enlarging the useable data samples. The fully compatible DBMSs make possible the combining and sharing of data on other communications-electronics systems.

TECH STARS and COMM STARS comprise an extensive data base of over 165 communications-electronics systems. Cost data is available on over 400 generic components. There are 18 generic system categories and 25 generic component categories represented. Figures 11 and 12 illustrate the projected distribution of systems and components in the combined data bases.

MCR

COMBINED SYSTEM COST MATRICES TECH STARS/COMM STARS DATA BASES

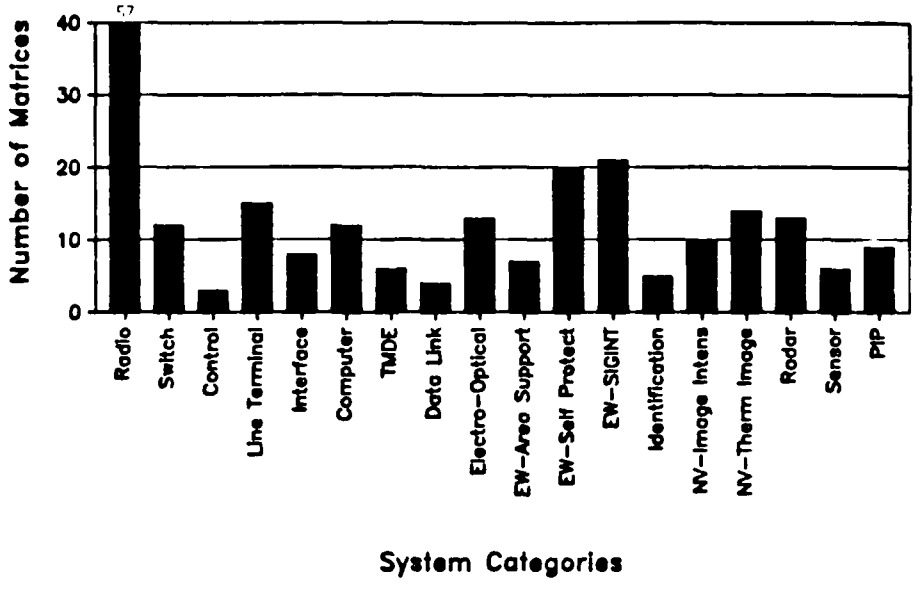


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Exhibit 11

MCR

COMBINED COMPONENT COST MATRICES TECH STARS/COMM STARS DATA BASES

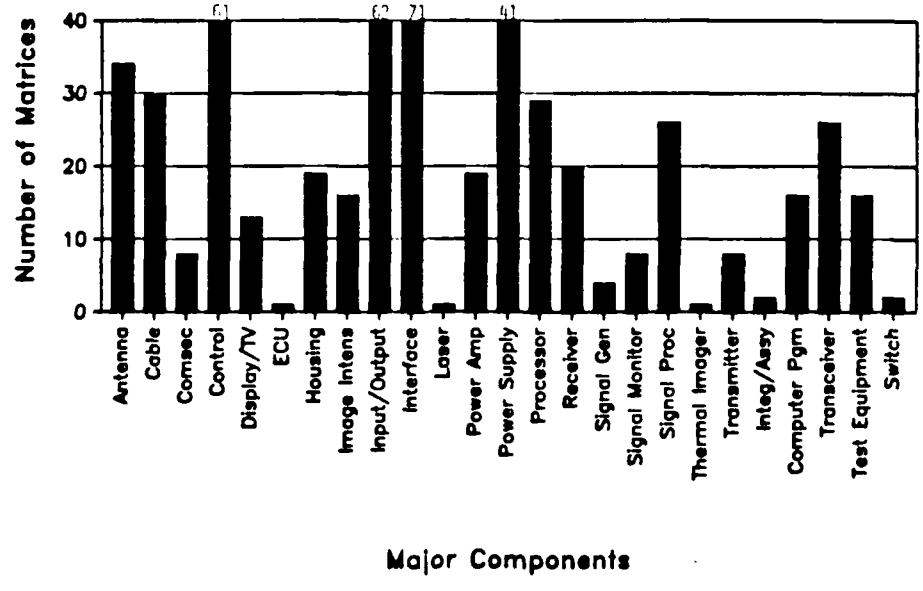

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Exhibit 12

MC
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BUILDING COMMUNICATIONS-ELECTRONICS DATA BASES FOR CER DEVELOPMENT

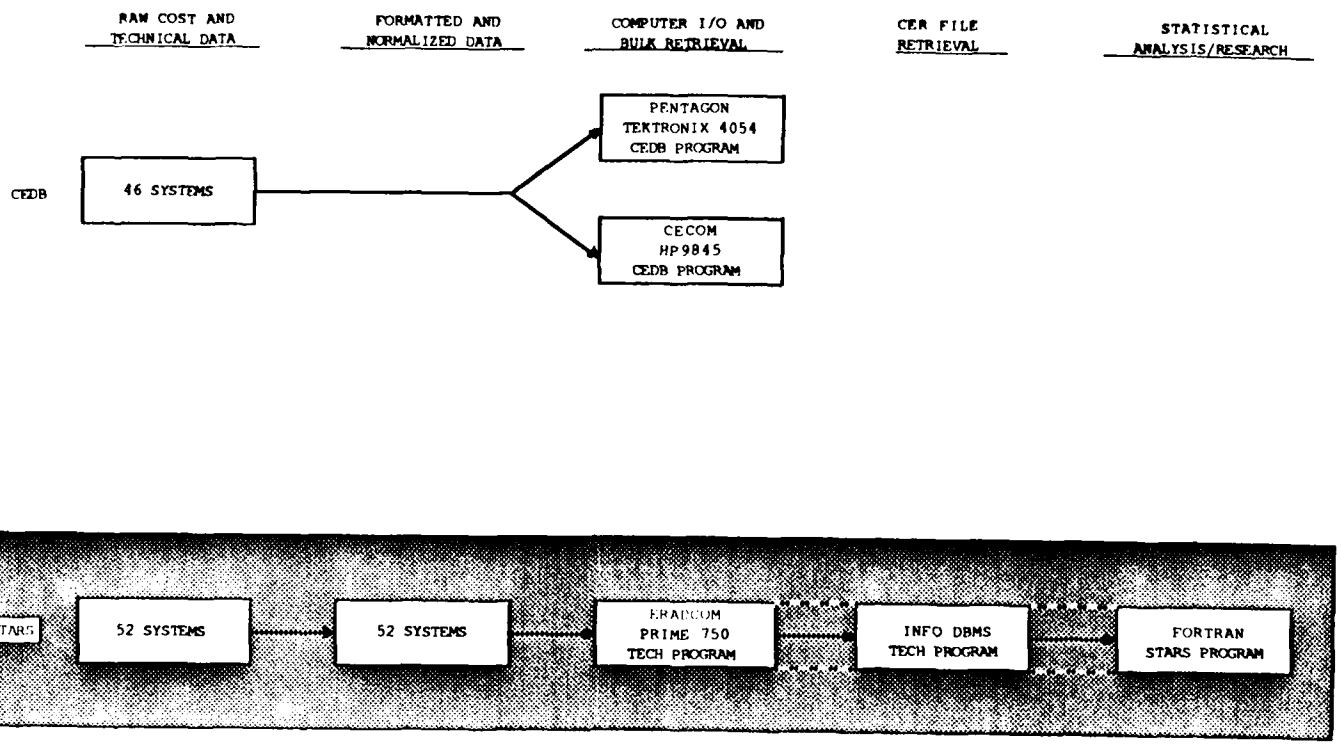
GEORGE R. KREISEL

PRESENTED TO
THE NINETEENTH ANNUAL DOD COST ANALYSIS SYMPOSIUM
XEROX INTERNATIONAL TRAINING CENTER
LEESBURG, VIRGINIA
17-20 SEPTEMBER 1985

MANAGEMENT CONSULTING & RESEARCH, INC.
FOUR SKYLINE PLACE
5113 LEESBURG PIKE, SUITE 509
FALLS CHURCH, VIRGINIA 22041
(703) 820-4600

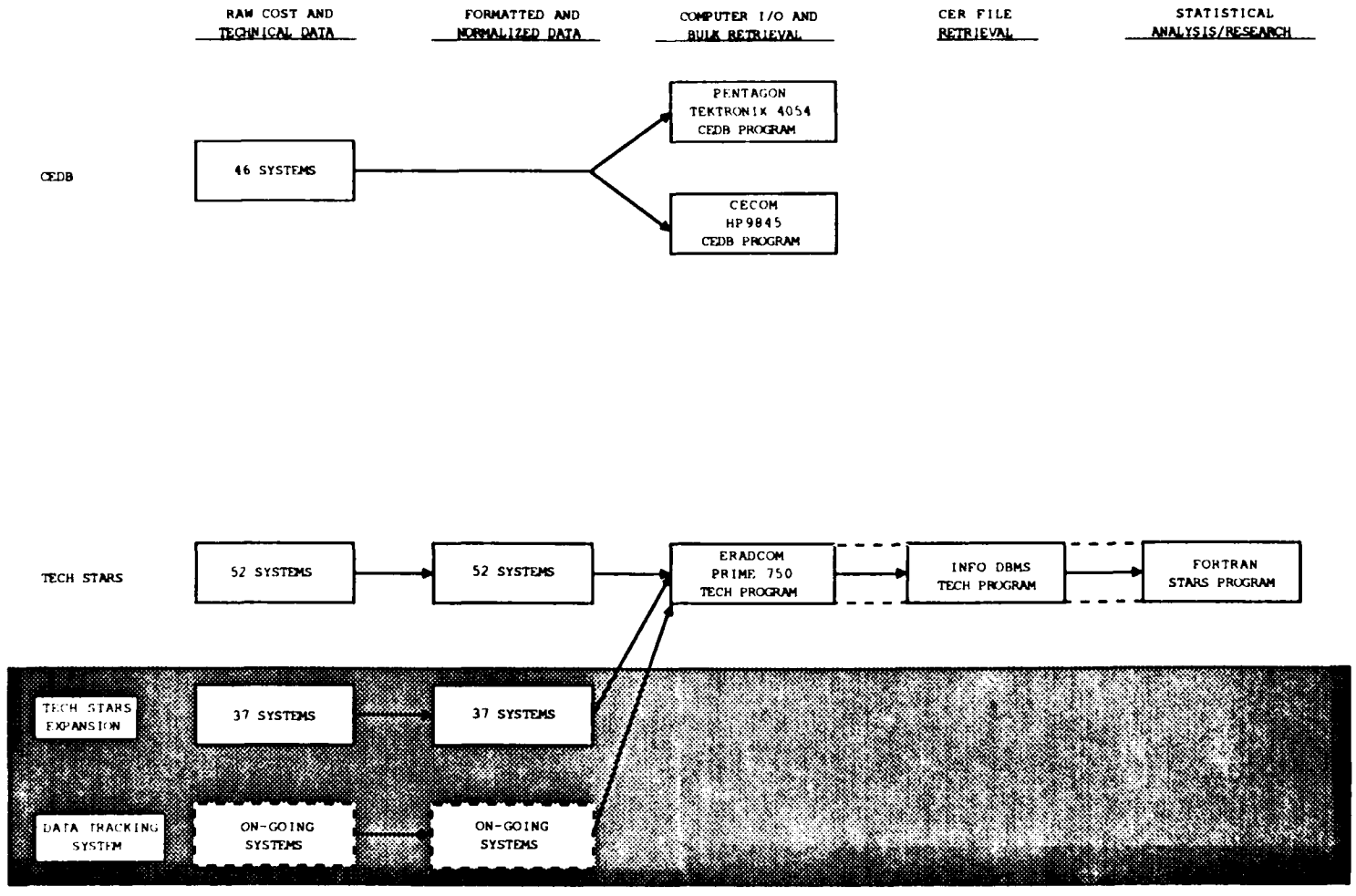
MCR

PHASE II - TECH STARS



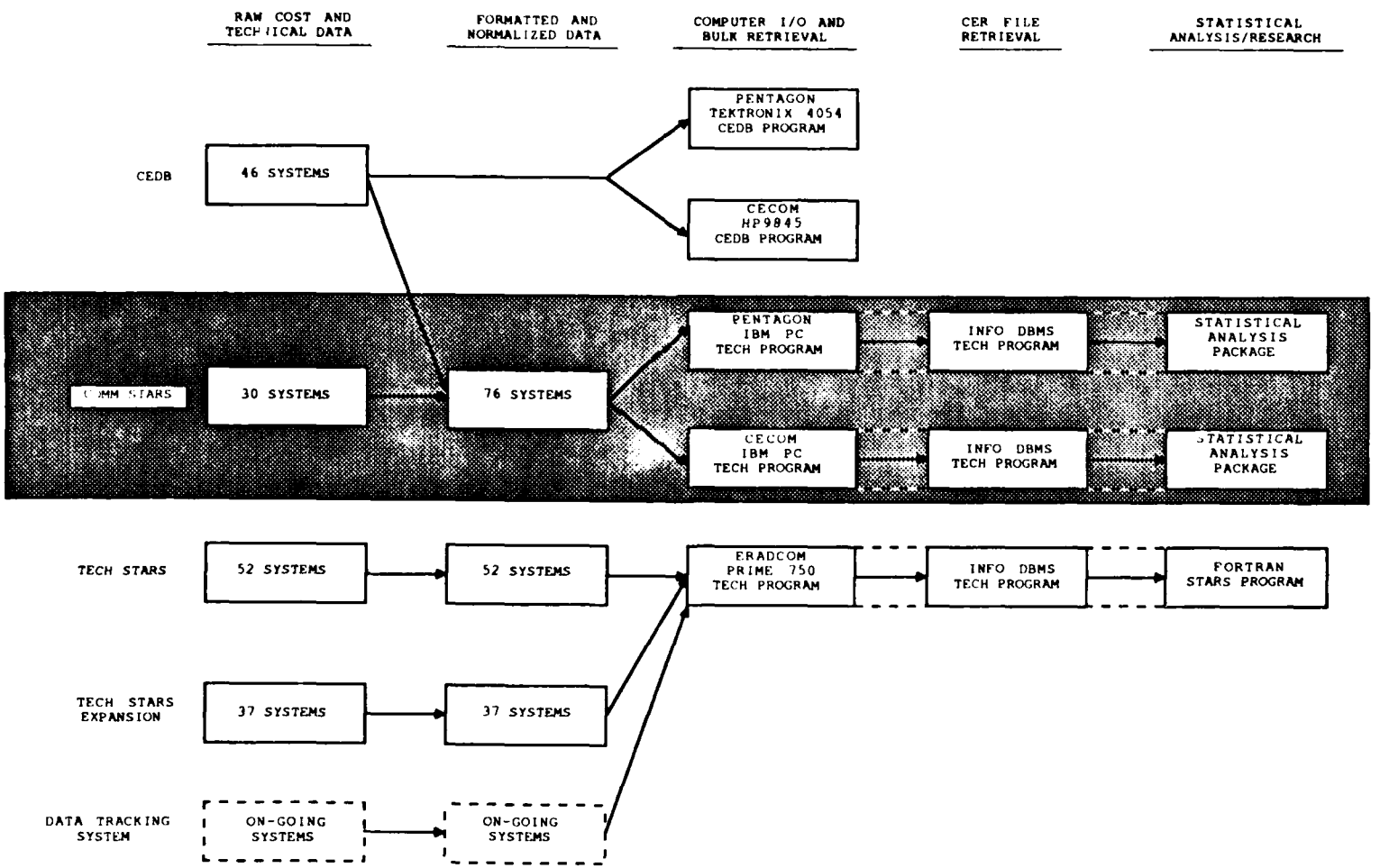
MCR

PHASE III - TECH STARS ENHANCEMENTS



MCR

PHASE IV - COMM STARS



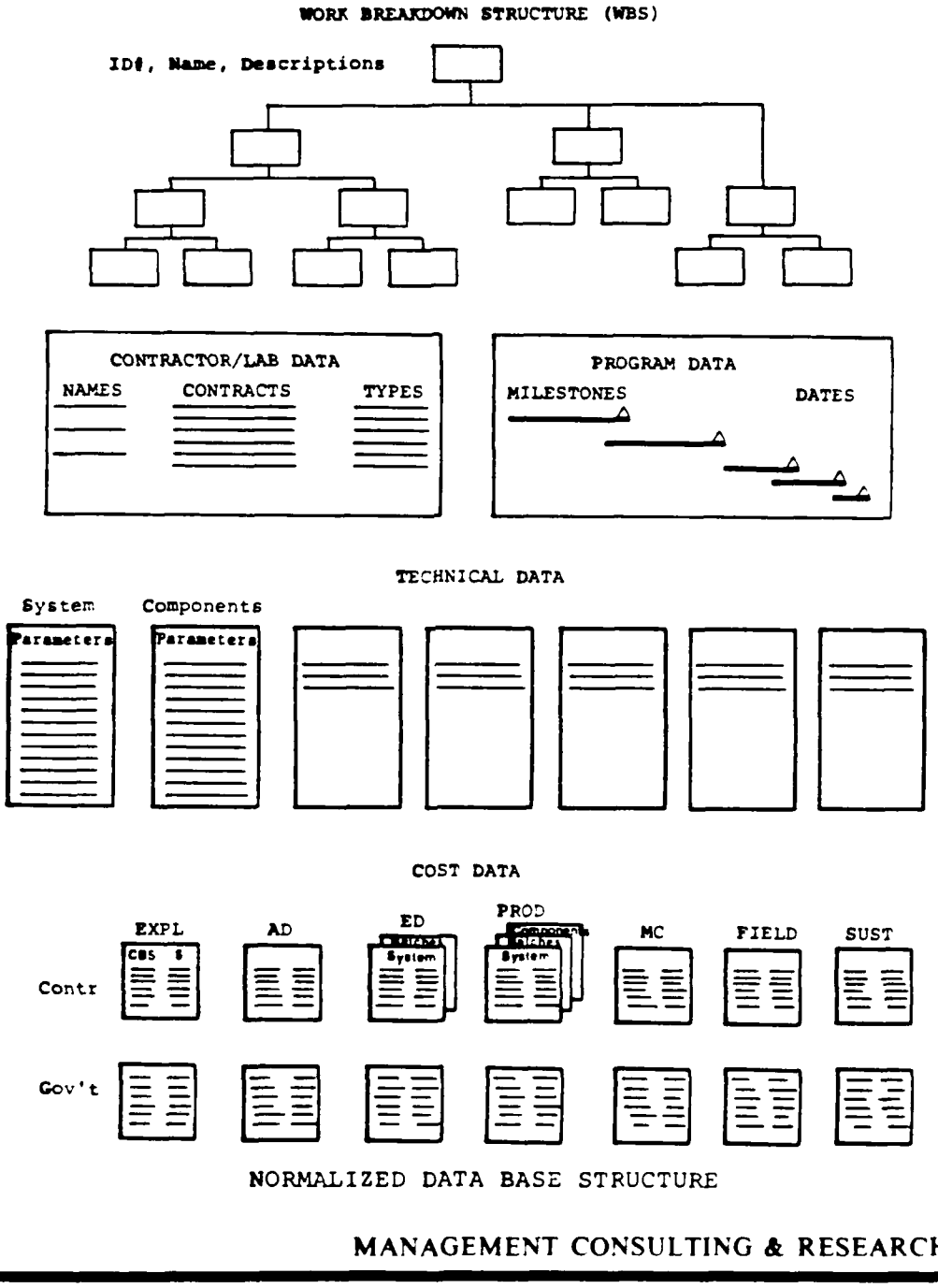
MCR

DISCUSSION TOPICS

- BACKGROUND
- **DESCRIPTION OF DATA BASES**
- METHODOLOGY
- SYSTEM OPERATION
- POTENTIAL APPLICATIONS
- SUMMARY

MCR

OVERVIEW



NORMALIZED DATA BASE STRUCTURE

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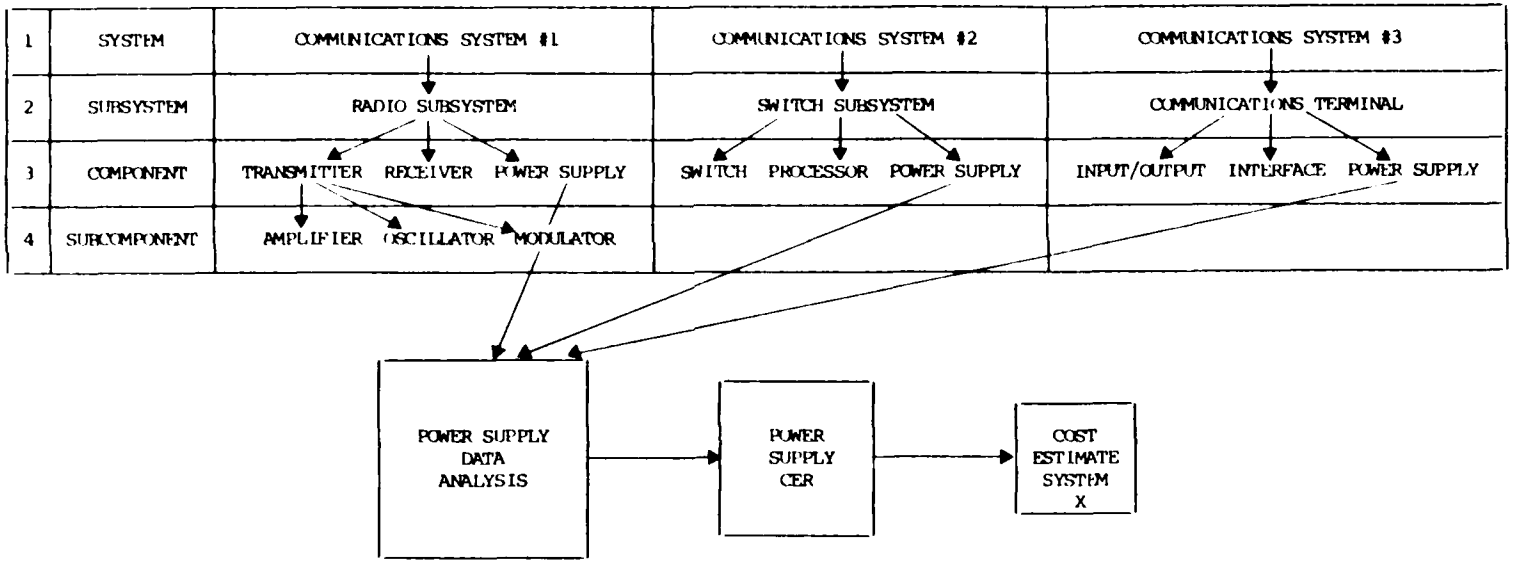
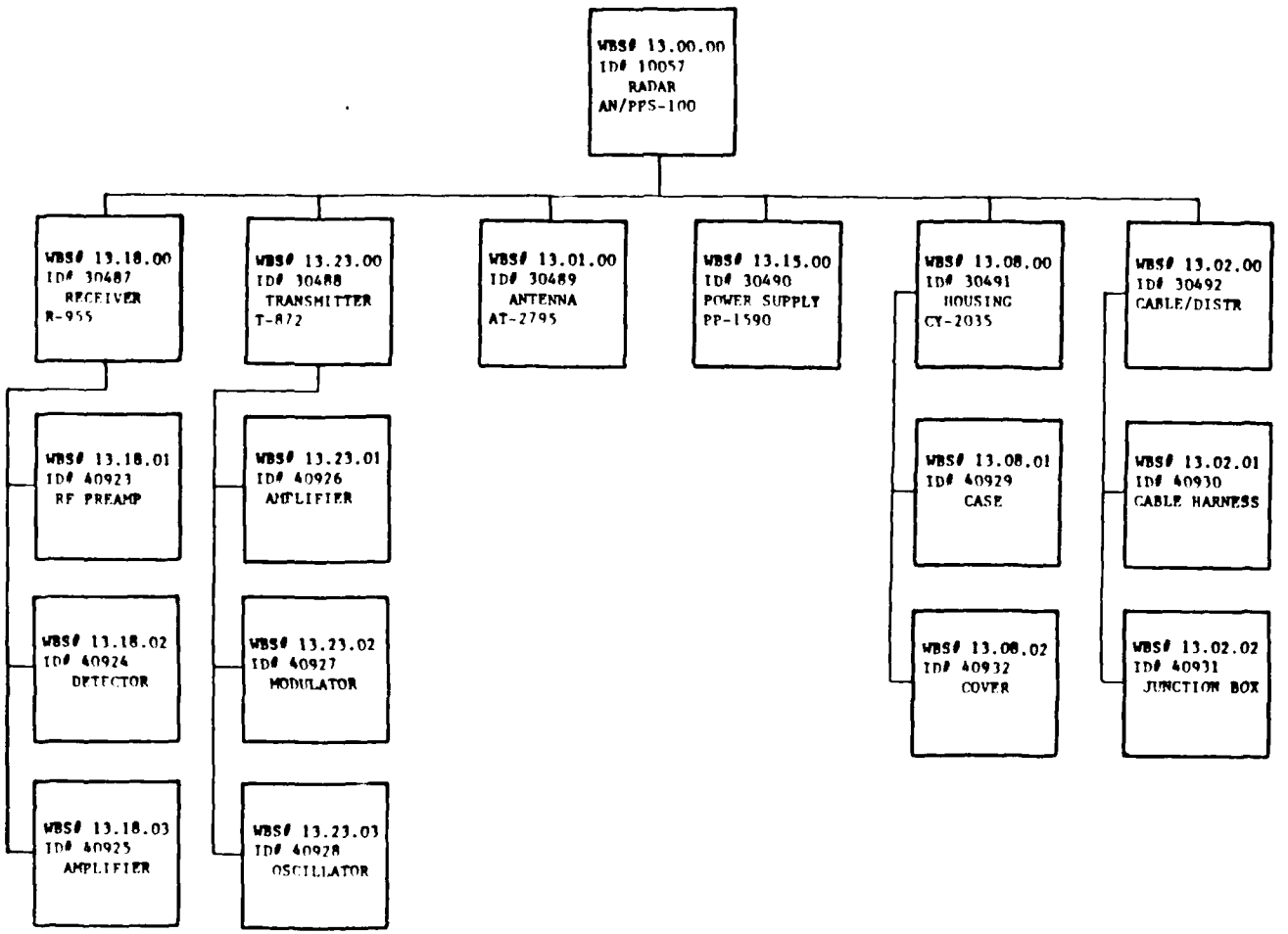
SYSTEM CONCEPT



MC
R

EXAMPLE OF WORK BREAKDOWN STRUCTURE



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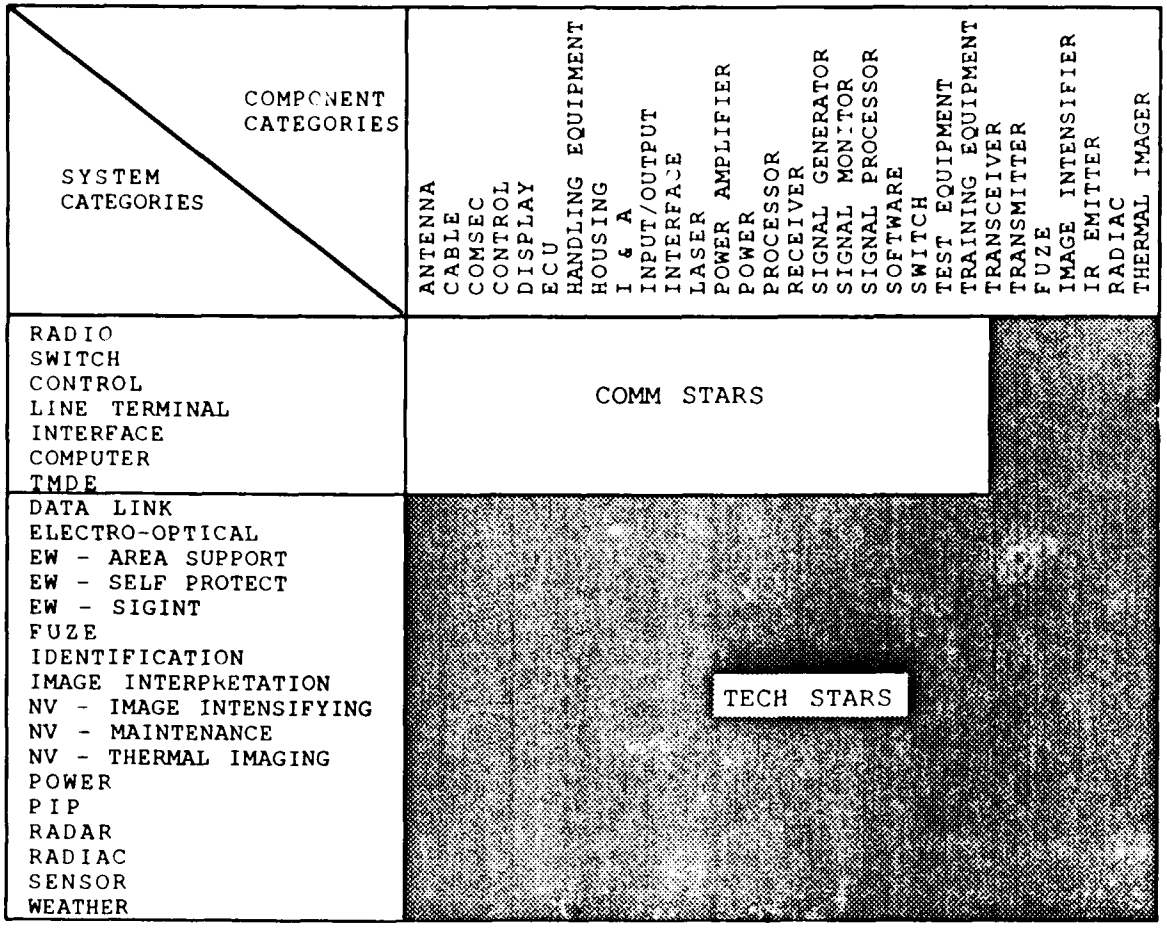
WBS SYSTEM/COMPONENT CATEGORIES



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COST BREAKDOWN STRUCTURE

FUND APP	CBS NO.	COST ELEMENT
RD	1.0	DEVELOPMENT
RD	1.01	DEVELOPMENT ENG
RD	1.011	ENGINEERING
RD	1.012	PROD ENG, & PLAN (PEP)
RD	1.013	TOOLING
RD	1.014	PROTOTYPE MANUFACTURE
RD	1.02	DATA
RD	1.03	SYSTEMS TEST & EVAL
RD	1.04	SYS/PROJ MGMT
RD	1.05	ILS TRAIN, SERV & EQ
RD	1.06	FACILITIES
RD	1.07	OTHER RDT&E FUND DEV
RD	1.071	OTHER RDT&E COST
RD	1.072	CONTR G&A
RD	1.073	CONTR FEE
RD	1.074	OTHER CONTR BURDEN
RD	1.S1	DEVEL SUPPT (ST 1.02-1.071)
RD	1.S2	DC + OH (ST 1.01-1.071)
RD	1.S3	CONTR MARKUP (ST 1.072-1.074)
PR	2.0	PRODUCTION
PR	2.01	NON-RECURRING PROD
PR	2.02	RECURRING PRODUCTION
PR	2.021	MANUFACTURING
PR	2.022	RECURRING ENG
PR	2.023	SUSTAINING TOOLING
PR	2.024	QUALITY CONTROL
PR	2.03	ENGINEERING CHANGES
PR	2.04	DATA
PR	2.05	SYSTEM TEST & EVAL
PR	2.06	ILS TRAIN, SERV & EQ
PR	2.07	INITIAL SPARES
PR	2.08	OPERAT/SITE ACTIV
PR	2.09	OTHER PROC FUND PROD
PR	2.091	OTHER PRODUCTION COST
PR	2.092	CONTR G&A
PR	2.093	CONTR FEE
PR	2.094	OTHER CONTR BURDEN
PR	2.S1	PROD SUPPT (ST 2.04-2.091)
PR	2.S2	DC + OH (ST 2.01-2.091)
PR	2.S3	CONTR MARKUP (ST 2.092-2.094)

MC
R

DISCUSSION TOPICS

- BACKGROUND
- DESCRIPTION OF DATA BASES
- **METHODOLOGY**
- SYSTEM OPERATION
- POTENTIAL APPLICATIONS
- SUMMARY

MCR

DATA COLLECTION

- DEVELOPMENT/PRODUCTION COSTS
  - COMPLETE COST HISTORY BY PHASE/BATCH
    - BY ARMY CBS ELEMENT
    - BY WBS COMPONENT
- TECHNICAL/FUNCTIONAL DATA
  - PARAMETERS AFFECTING COST (COST DRIVERS)
- PROGRAM DATA
  - DATES
    - LIFE CYCLE PHASES
    - IOC
  - PECULIARITIES

MCR

ADJUSTMENT AND NORMALIZATION

- COSTS IN CONSTANT DOLLARS
- HISTORICAL INDICES FOR COMMUNICATIONS AND ELECTRONICS
- STANDARDIZED COST BREAKDOWN STRUCTURE (CBS)
- TOTAL COSTS BY BATCH (CONTINUOUS PRODUCTION RUN)
- COSTS AT SYSTEM AND GENERIC COMPONENT LEVEL
- FIRST UNIT COST AND SLOPE FOR RECURRING COSTS
- TECHNICAL DATA AND UNITS STANDARDIZED
- ALL PECULIARITIES FOOTNOTED
- READY FOR CER DEVELOPMENT

MCR

CHART OF ACCOUNTS

1.0 DEVELOPMENT (SUM OF 1.01 THRU 1.07)

1.01 DEVELOPMENT ENGINEERING (SUM OF 1.011, 2, 3, & 4)

1.011 ENGINEERING

- Specifications
- Engineering Drawings
- Parts Lists
- Wiring Diagrams
- Study/Analysis/Design Development
- Evaluation/Testing of WBS COmponents
- Redesign
- Analysis of Test Results/Data Reduction
- Reliability/Maintainability/QC Requirements
- Component Engineering
- Engineering Test Equipment for Component Engineering
- Pre-planned Product Improvement (PPPI) Engineering
- Software System Development
- Program Development
- S/W Configuration/Documentation
- S/W Development/Testing/IQA
- System Integration
- Systems Analysis
- Safety, Survivability/Vulnerability, Tempest, EMI/EMC Program
- Configuration Management Program
- Network Analysis/Simulation
- Contractor Support/Service
- Design Support/Verification
- DTC/DTUC Program
- Change Orders/ECPs

1.012 PRODUCABILITY ENGINEERING AND PLANNING (PEP)

- Technical Data Package (TDP)
- Quality Assurance (QA) Plans
- Special Production Processes
- Production Engineering

MC
R

NORMALIZATION SPREADSHEET

INVESTMENT PHASE ESCALATION WORKSHEET

SYSTEM: AN/PPS-15

No.Years	1		81	82	83	Constant $ Totals	%	FUC	alfa	beta	1	2	4		
														57	33.45
														58	33.83
							Constant $							59	34.64
2.01 NonRec	0						92		1.858	2.548				60	34.55
														61	35.05
														62	34.64
														63	34.74
2.021 Manf.	0	0	0	0	0	0	92	0	1.858	2.548				64	34.88
2.022 RecEng	0	0	0	0	0	0	92	0	1.858	2.548				65	35.26
2.023 SusTool	0	0	0	0	0	0	92	0	1.858	2.548				66	36.43
2.024 QualInt	0	0	0	0	94575	94575	92	3685.	1.858	2.548			94575	67	37.75
2.02 Recurring	1	124,382	533923.	621480.	175869.	1331272	92	51871	1.858	2.548	.162097	.203010	.060263 .425370	68	39.03
						1425847	92	55556						69	40.26
2.03 Eng. Change	0	0	0	0	43997	43997							43997	70	41.85
														71	43.75
2.041 ILS Data	0	0	0	0	0	0								72	45.43
2.042 nILS Dat	0	0	0	0	0	0								73	47.32
2.04 Data	0	0	52506.8	0	1897	54403.8					46521		1897	74	50.04
														75	54.45
2.051 ILS STAE	0	0	0	0	0	0								76	58.04
2.052 nILS STE	0	0	0	0	0	0								76.5	60.11
2.05 STAE	0	0	33425.5	0	0	33425.5					29615			77	62.37
														78	66.62
2.06 ILS Train	0	0	0	0	0	0								79	72.43
														80	80.1
2.07 Int. Spares	0	0	0	0	0	0								81	88.6
														82	95.33
2.08 Oper. Site	0	0	0	0	0	0								83	100
														84	104.3
2.091 Othr Pro	0	0	0	0	0	0								85	109.41
2.51 Prd.Supt.	0	0	0	0	0	0								86	114.44
2.52 OC+OH	0	0	619856.	621480.	221763.	1463099	92	57008						87	119.37
2.092 Cntr G&A	0	0	61985.6	62148.0	22176.3	146310.								88	124.14
2.093 Cntr Fee	0	0	77048.1	77250.0	27565.2	181863.								89	128.73
2.094 OtherBrd	0	0	0	0	0	0								90	133.49
2.53 Cntr Markup	0	0	0	0	0	0								91	138.43
														92	143.56
2.0 Product.Ttl	0	0	758889.	760878.	271505.	1791272	92	69794						93	148.87
Quantity						40								94	154.37

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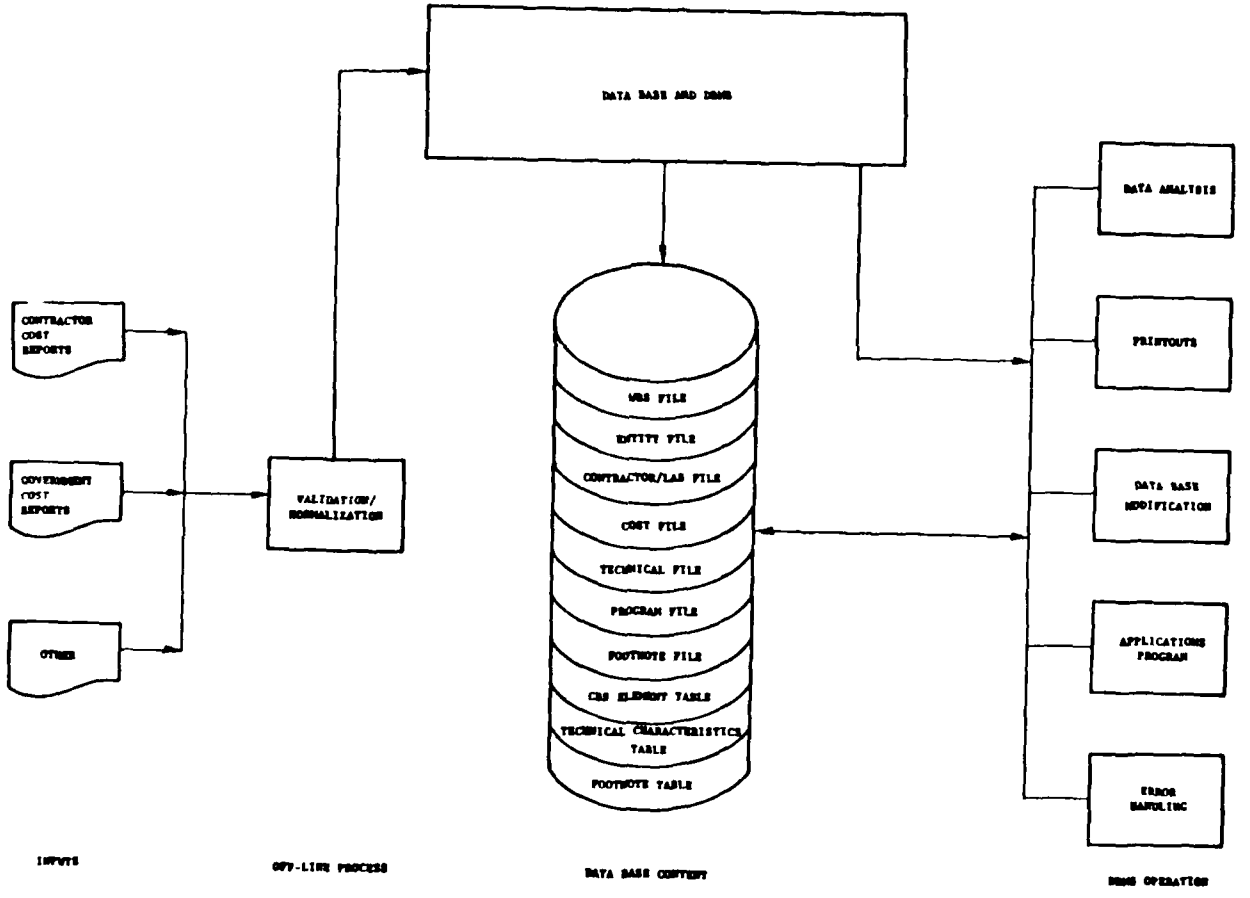
DISCUSSION TOPICS

- BACKGROUND
- DESCRIPTION OF DATA BASES
- METHODOLOGY
- **SYSTEM OPERATION**
- POTENTIAL APPLICATIONS
- SUMMARY

MC
R

DATA ENTRY AND RETRIEVAL



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INPUTS

	SYSTEM	SUB-SYSTEM	COMPONENT	SUB-COMPONENT
• PROGRAM DATA	✓			
• WORK BREAKDOWN STRUCTURE	✓			
• CONTRACTOR/LAB DATA	✓			
• NORMALIZED DEVELOPMENT COST DATA	✓	✓	✓	✓
• NORMALIZED PRODUCTION COST DATA	✓	✓	✓	✓
• TECHNICAL PARAMETERS	✓		✓	

NORMALIZED PRODUCTION COST DATA

System: AN/AVS-6 ID #: 10042 Date: 6/25/84
Component: ID #: Analyst: TBF
Batch #: 1 No. of Lots: 2 Contractor/Lab #: 0007
LCP: 4

Cost Elements	CONSTANT $ TOTAL	1st UNIT COST	SLOPE %	QUANTITY	NO. YRS	EST% COMP	SOURCE CODE	CLASS	FN #
2.01 Non-Recurring	2323050				3	56	CR	U	135
2.021 Manufacturing									
2.022 Recurring Eng									
2.023 Sustain Tooling									
2.024 Quality Control									
2.02 Recurring Subtotal	14280664	29882	92	1111	3	56	CR	U	136
2.03 Eng Changes									
2.04 Data	35215				3	56	CR	U	133
2.05 ST&E									
2.06 ILS Training									
2.07 Initial Spares	2493319				3	56	CR	U	132
2.08 Operat/Site Activ									
2.091 Other Production Cost									
2.S1 Prod Supt (ST2.04-091)	2528534				3	56	CR	U	132
2.S2 DC+OH (ST2.01-091)	19132248	40034	92	1111	3	56	CR	U	134
2.092 Contr G&A									
2.093 Contr Fee									
2.094 Other Contr Burden									
2.S3 Ctr Markup (ST2.092-094)									
2.09 Other Proc Fund Prod									
2.0 Production Total									

EXAMPLE

ANALYST H. Bennett DATE 8/1/84

RADAR SYSTEM PARAMETERS WBS 13.XX

SYSTEM AN/TPQ-36 ID# 10053

	PARAMETER	UNIT		VALUE	C	FN#
1.	CENTER FREQUENCY	MHZ	1.			
2.	BANDWIDTH	MHZ	2.			
3.	OUTPUT POWER	KW	3.			
4.	RATED RANGE	KM	4.			
5.	NOISE FIGURE	DB	5.			
6.	EMISSION TYPE	PULSE...	6.	PULSE	U	0
7.	ANTENNA TYPE	PARABOLIC..	7.	ARRAY	U	1342
8.	ANTENNA SIZE	SQ. FEET	8.	26.95	U	0
9.	AZIMUTH COVERAGE	DEGREES	9.	40	U	0
10.	NO. OF HOUSINGS	QTY	10.	1	U	0
11.	NO. OF TRANSMITTERS	QTY	11.	1	U	0
12.	NO. OF RECEIVERS	QTY	12.	1	U	0
13.	NO. OF ANTENNAS	QTY	13.	1	U	0
14.	NO. OF AMPS/PREAMPS	QTY	14.	1	U	0
15.	NO. OF PROCESSORS	QTY	15.	-	U	1343
16.	NO. OF SIGNAL PROCESSORS	QTY	16.	1	U	0
17.	NO. OF SIG GEN/SYNTH ASSYS	QTY	17.	-	U	1344
18.	NO. OF I/O ASSYS	QTY	18.	3	U	0
19.	NO. OF CONTROLS	QTY	19.	3	U	0
20.	NO. OF DISPLAYS	QTY	20.	1	U	0
21.	NO. OF CABLE ASSYS	QTY	21.	1	U	0
22.	NO. OF POWER ASSYS	QTY	22.	3	U	0
23.	NO. OF TRANSCEIVERS	QTY	23.	2	U	0
24.	NO. OF INTERFACES	QTY	24.	3	U	0
25.	NO. OF COMSEC ASSYS	QTY	25.			
26.			26.			
27.	POWER CONSUMPTION	WATTS	27.			
28.	HOUSING TYPE	RACK...	28.			
29.	WIDTH	INCHES	29.	-	U	772
30.	DEPTH	INCHES	30.	-	U	772
31.	HEIGHT	INCHES	31.	-	U	772
32.	WEIGHT	POUNDS	32.	22,432	U	773
33.	EMI/EMC COMPATIBLE	Y/N	33.			
34.	TEMPEST QUALIFIED	Y/N	34.			
35.	NBC HARDENED	Y/N	35.			
36.	MTBF	HOURS	36.	90	U	0
37.	MTTR	MINUTES	37.	30	U	0
38.	DEPLOYMENT ENVIRONMENT	AIRCRAFT...	38.	GM	U	0
39.	PARTS COUNT	QTY	39.			
40.	GATE COUNT	QTY	40.			

REMARKS:

SOURCES:

EXAMPLE

MCR

OUTPUTS

- COST/CHARACTERISTIC ANALYSIS FILE
- COST-TO-COST ANALYSIS FILE
- WBS SEARCH
- SYSTEM SUMMARY
- CONTRACTOR/LABORATORY SEARCH
- PARENT ID SEARCH
- REFERENCE TABLES

MCR

ANALYSIS FILE

9/17/85 PAGE 1

******UNCLASSIFIED**********~~PROPRIETARY DATA~~******

COMM STARS

COST/CHARACTERISTIC ANALYSIS FILE

WBS#: 17.00.00 LIFE-CYCLE PHASE: 4 CBS#: 2.0

C	ID#	NOMENCLATURE	DESCRIPTION	B#	CONST$	TOT YR	FIRST UC	SLOPE	QUANT	LT	F#
U	10506	SINCGARS-V	VHF RADIO	1	84639648	4	1700000	70.0	2850	2	1
U	10510	AN/TSC-85A	SATELL. COMM	1	5529855	4	887688	92.0	8	1	2
U	10510	AN/TSC-85A	SATELL. COMM	2	58444841	6	1149592	92.0	87	1	3
U	10523	AN/GRC-193	HF RADIO SET	1	6135791	1	66947	92.0	170	1	4
U	10527	AN/TSC-99	SFBCS BASE S	1	36752557	4	3214770	83.0	28	3	6
U	10528	AN/VSC-7	UHF SAT BASE	4	3770960	4	170000	92.0	35	3	8
U	10529	AN/PRC-70	HF/VHF RADIO	1	41813489	5	58265	96.0	1083	3	10
U	10530	AN/PRC-77	VHF RADIO SE	1	66867791	3	11184	92.0	19635	2	11
U	10531	AN/GRC-103(V	RADIO SET	3	44719589	5	91550	92.0	1139	4	17
U	10532	AN/GRC-144(V	RADIO	1	22847196	4	120000	92.0	404	1	19
U	10534	AN/VRC-46	RADIO SET	1	25535795	3	1191	92.0	6569	1	22
U	10539	AN/FSC-78	COMM. TERMIN	1	146566838	5	11528300	92.0	18	1	24
U	10540	AN/FSC-79	COMM TERMINA	1	40713009	5	9882010	92.0	5	1	25
U	10546	AN/GSC-52(V)	SATELLITE TE	1	192788149	5	11669845	85.0	39	1	26
U	10551	AN/GYK-29(V)	BATTERY COMP	1	157211920	6	440000	92.0	798	5	27

MORE?

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ANALYSIS FILE (CONT'D)

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******UNCLASSIFIED******
COST/CHARACTERISTIC ANALYSIS FILE
WBS#: 17.00.00 LIFE CYCLE PHASE: 4 CBS#: 2.0

C	ID#	SYST#	CONTR/LAB NAME	SOURCE	EPC	N	SRVC	START	DURA	IOC	F#
U	10506	10506	ITT CORP., AERO	C	40		ARMY	1283	69	885	1
U	10510	10510	R.C.A.	M	100		ARMY	1075	114	382	2
U	10510	10510	HARRIS CORP.	C	80		ARMY	1075	114	382	3
U	10523	10523	HUGHES, GROUND	C	100		NAVY	181	19	682	4
U	10527	10527	ROCKWELL INTERN	C	67		ARMY	980	45	684	6
U	10528	10528	CINCINNATI ELEC	C	70		ARMY	981	41	984	8
U	10529	10529	CINCINNATI ELEC	C	100		ARMY	1078	60	179	10
U	10530	10530	RCA	M	100		ARMY	666	178	668	11
U	10531	10531	CANADIAN MARCON	C	85		ARMY	682	57	883	17
U	10532	10532	ITT CORP., DEF.	C	40		ARMY	1281	44	985	19
U	10534	10534	TADRIAN ISRAEL	C	28		ARMY	882	40	1284	22
U	10539	10539	FORD AEROSPACE	P	100		ARMY	674	56	0	0 24
U	10540	10540	FORD AEROSPACE	P	100		ARMY	674	56	0	0 25
U	10546	10546	FORD AREOSPACE	C	10		ARMY	1082	63	285	26
U	10551	10551	NORDEN SYSTEMS,	C	90		ARMY	480	80	1282	27

MORE?

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ANALYSIS FILE (CONT'D)

9/17/85 PAGE 1

******UNCLASSIFIED******

COST/CHARACTERISTIC ANALYSIS FILE

WBS#: 17.00.00 LIFE-CYCLE PHASE: 4 CBS#: 2.0

C	ID#	RECEIV CTR FREQ MHZ	RECEIVE BW MHZ	TRANSM CTR FREQ MHZ	TRANSMIT BW MHZ	F#
U	10506	59	29	59	29	1
U	10510					2
U	10510					3
U	10523					4
U	10527	16	14	16	14	6
U	10528					8
U	10529	39	37	39	37	10
U	10530	53	23	53	23	11
U	10531	1600	250	1600	250	17
U	10532	4700	300	4700	300	19
U	10534					22
U	10539	7500	250	8150	250	24
U	10540	7500	250	8150	250	25
U	10546	7500	250	8150	250	26
U	10551					27

MORE?

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ANALYSIS FILE (CONT'D)

3/17/85 PAGE 1

~~***PROPRIETARY DATA - FOR OFFICIAL USE ONLY***~~

1 SINCGARS IS A FAMILY OF FREQUENCY HOPPING, VHF, FM RADIO.
SINCGARS WAS DEVELOPED TO OFFSET THE THREAT OF
SINGLE-FREQUENCY JAMMING TECHNIQUES THAT CURRENT
FIXED-FREQUENCY MANPACK AND VEHICULAR COMBAT NET RADIOS
ARE SUSCEPTABLE TO. SINCGARS IS DESIGNED TO HANDLE VOICE
COMMUNICATIONS AND NATO COMPATIBLE DATA TRANSMISSION AND
WILL PROVIDE THE PRIMARY MEANS OF COMMAND AND CONTROL FOR
INFANTRY, ARMOR, AND ARTILLERY UNITS.
START DATE SHOWN IS CONTRACT AWARD DATE.
CONTRACT NUMBER CHANGED FROM DAAB07-83-C-K561.
SINCGARS-V WENT DIRECTLY FROM AD TO PRODUCTION PHASE.
DURATION FROM CONTRACT AWARD DATE THROUGH DATE OF LAST
SCHEDULED DELIVERY UNDER THIRD OPTION YEAR (4TH PROGRAM
YEAR). CONTRACT STILL OPEN AS OF 6/85.
FFP TOTALS WERE TAKEN FROM THE CONTRACT FOR EACH COST
ELEMENT. CONTRACTOR BURDEN COSTS WERE TAKEN OUT OF EACH
COST ELEMENT. EACH COST ELEMENT WAS THEN SPREAD AND
MORE?

MCR

STATISTICAL ANALYSIS FILE

A0: IDNUMBER$ 65512 READY

Type / for Command Menu

Name	A IDNUMBER$	B BATCH$	C CONSTTOT	D #YEARS	E FRSTUNIT	F SLOPE	G QUANTITY
1	10506	1	84639648	4	1700000	70	2850
2	10510	1	5529855	4	887688	92	8
3	10510	2	58444841	6	1143592	92	87
4	10523	1	6135791	1	66347	92	170
5	10527	1	36752557	4	3214770	83	28
6	10528	4	3770960	4	170000	92	35
7	10529	1	41813489	5	58265	96	1083
8	10530	1	66867791	3	11184	92	19635
9	10531	3	44719589	5	91550	92	1139
10	10532	1	22847196	4	120000	92	404
11	10534	1	25535795	3	1191	92	6569
12	10539	1	146566838	5	11528300	92	18
13	10540	1	40713009	5	9882010	92	5
14	10546	1	192788149	5	11669845	85	39
15	10551	1	157211920	6	440000	92	798
16	10579	1	4068114	5	60301	92	120
17	10580	1	2135192	5	67186	92	51
18	10589	1	92279443	9	54270	98	2176
19	10591	1	9279968	3	0	0	0

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MCR STATISTICAL ANALYSIS FILE (CONT'D)

```
NO:    RCVBW                                                    65512 READY

Type / for Command Menu
        H          I          J          K          L          M          N
Name SERVICE$ STRTDATE$ DURATION      IOC$    CLASS$  RCVFREQ    RCVBW
1       ARMY      1283        69       885         .       59        29
2       ARMY      1075       114       382         .
3       ARMY      1075       114       382         .
4       NAVY       181        19       682         .
5       ARMY       980        45       684         .       16        14
6       ARMY       981        41       984         .
7       ARMY      1078        60       179         .       39        37
8       ARMY       666       178       668         .       53        23
9       ARMY       682        57       883         .     1600       250
10      ARMY      1281        44       985         .     4700       300
11      ARMY       882        40      1284         .
12      ARMY       674        56                   .             7500
13      ARMY       674        56                   .             7500
14      ARMY      1082        63       285         .     7500       250
15      ARMY       480        80      1282         .
16      ARMY       782        41       586         .       16        14
17      ARMY       782        56       586         .       16        14
18      ARMY      1276       108       778         .       13       325
19        AF       982        48       185         .       16        14
```

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DISCUSSION TOPICS

- BACKGROUND
- DESCRIPTION OF DATA BASES
- METHODOLOGY
- SYSTEM OPERATION
- **POTENTIAL APPLICATIONS**
- SUMMARY

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USES FOR DATA BASE

- CER DEVELOPMENT
  - SYSTEMS
  - COMPONENTS
- COST-TO-COST CER DEVELOPMENT
  - NON-RECURRING TO RECURRING COSTS
  - "BELOW-THE-LINE" TO HARDWARE COSTS
  - PRODUCTION TO DEVELOPMENT COSTS
- EVALUATION OF COST DRIVERS
- SYSTEM FAMILIARITY FOR INDEPENDENT COST ESTIMATES
- MODELING OF NEW SYSTEMS
- CONTRACT HISTORY ANALYSIS

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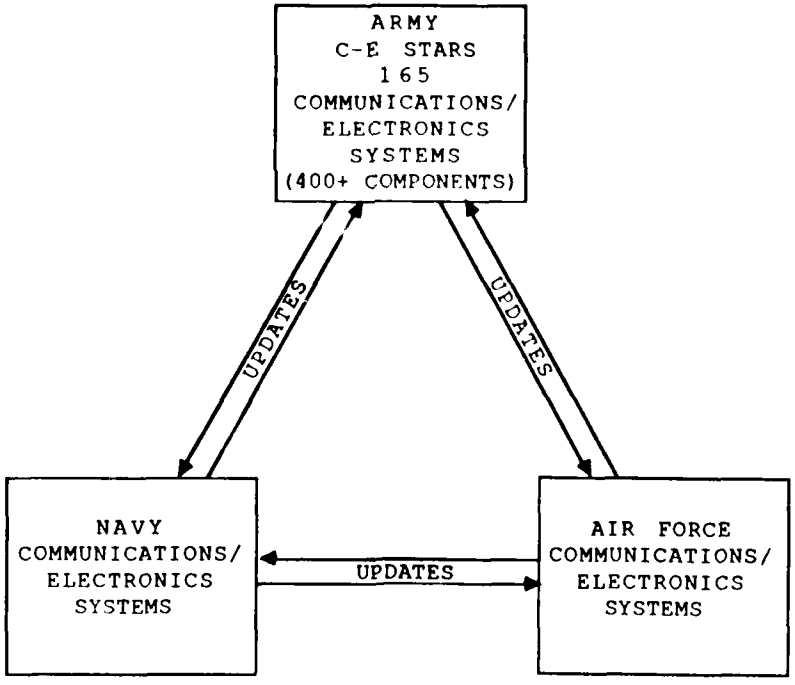
FUTURE DEVELOPMENTS?

- COMBINE TECH STARS AND COMM STARS INTO SINGLE DATA BASE (165 SYSTEMS, OVER 400 COMPONENTS)
- ADD OTHER COMMUNICATIONS-ELECTRONICS EQUIPMENT CATEGORIES
- EXPAND TO INCLUDE OTHER SERVICES AND AGENCIES

MCR

COMBINED DATA BASES



MC
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DISCUSSION TOPICS

- BACKGROUND
- DESCRIPTION OF DATA BASES
- METHODOLOGY
- SYSTEM OPERATION
- POTENTIAL APPLICATIONS
- **SUMMARY**

MCR

TECH STARS/COMM STARS DATA BASES

- EXTENSIVE DATA BASES OF 165 COMMUNICATIONS-ELECTRONICS SYSTEMS DEVELOPED
- OVER 400 GENERIC COMPONENTS INCLUDED IN DATA BASES
- CERs CAN BE GENERATED ON-LINE -- FOR SYSTEMS OR COMPONENTS
- 18 GENERIC SYSTEM CATEGORIES AND 25 GENERIC COMPONENT CATEGORIES INCLUDED
- GENERIC COMPONENTS CAN BE USED ACROSS SYSTEM BOUNDARIES TO ENLARGE CER DATA SAMPLES
- DATA BASES CAN BE ENTERED ON IBM PC-COMPATIBLE MICRO-COMPUTERS

MC
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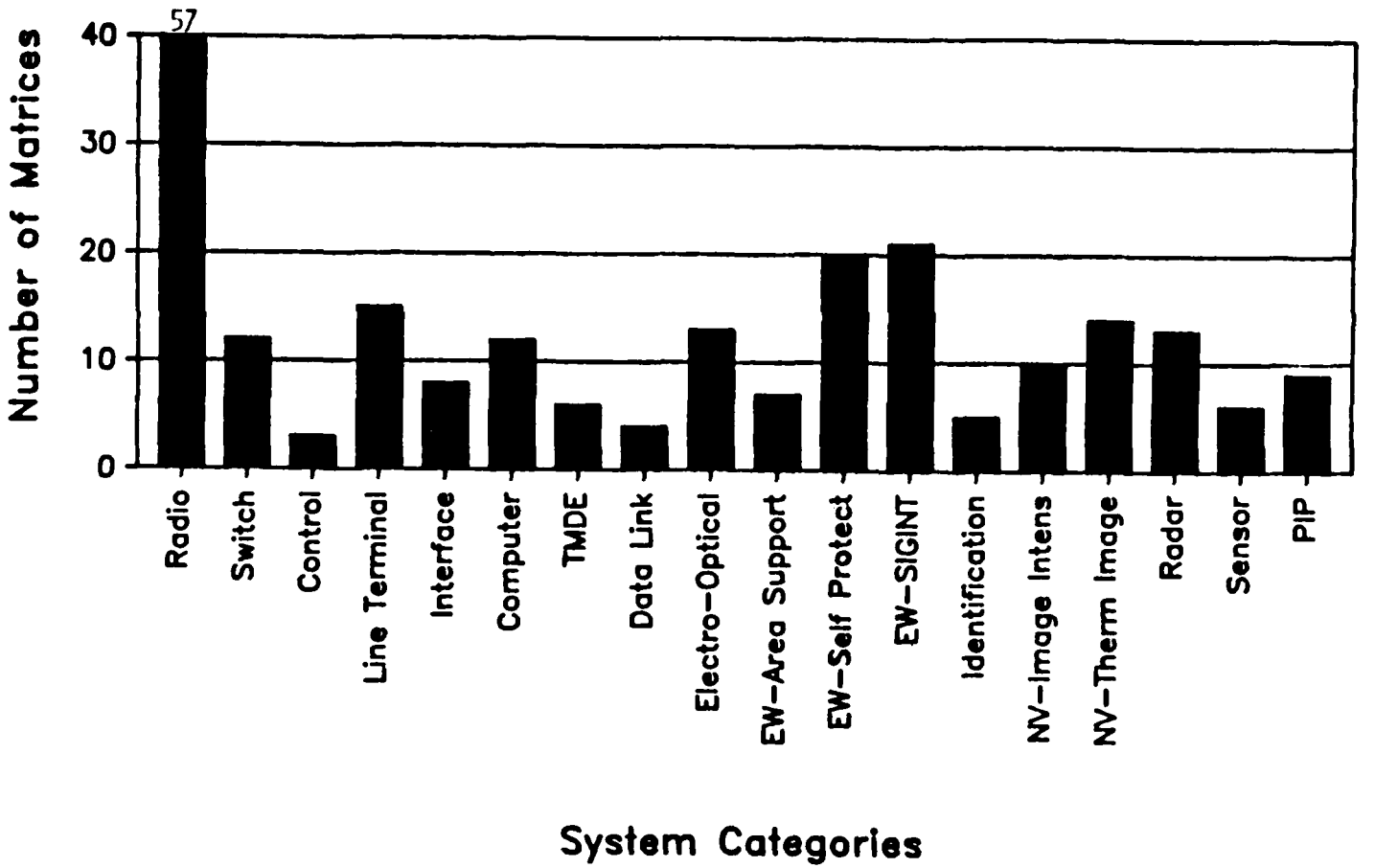
COMBINED SYSTEM COST MATRICES
TECH STARS/COMM STARS DATA BASES



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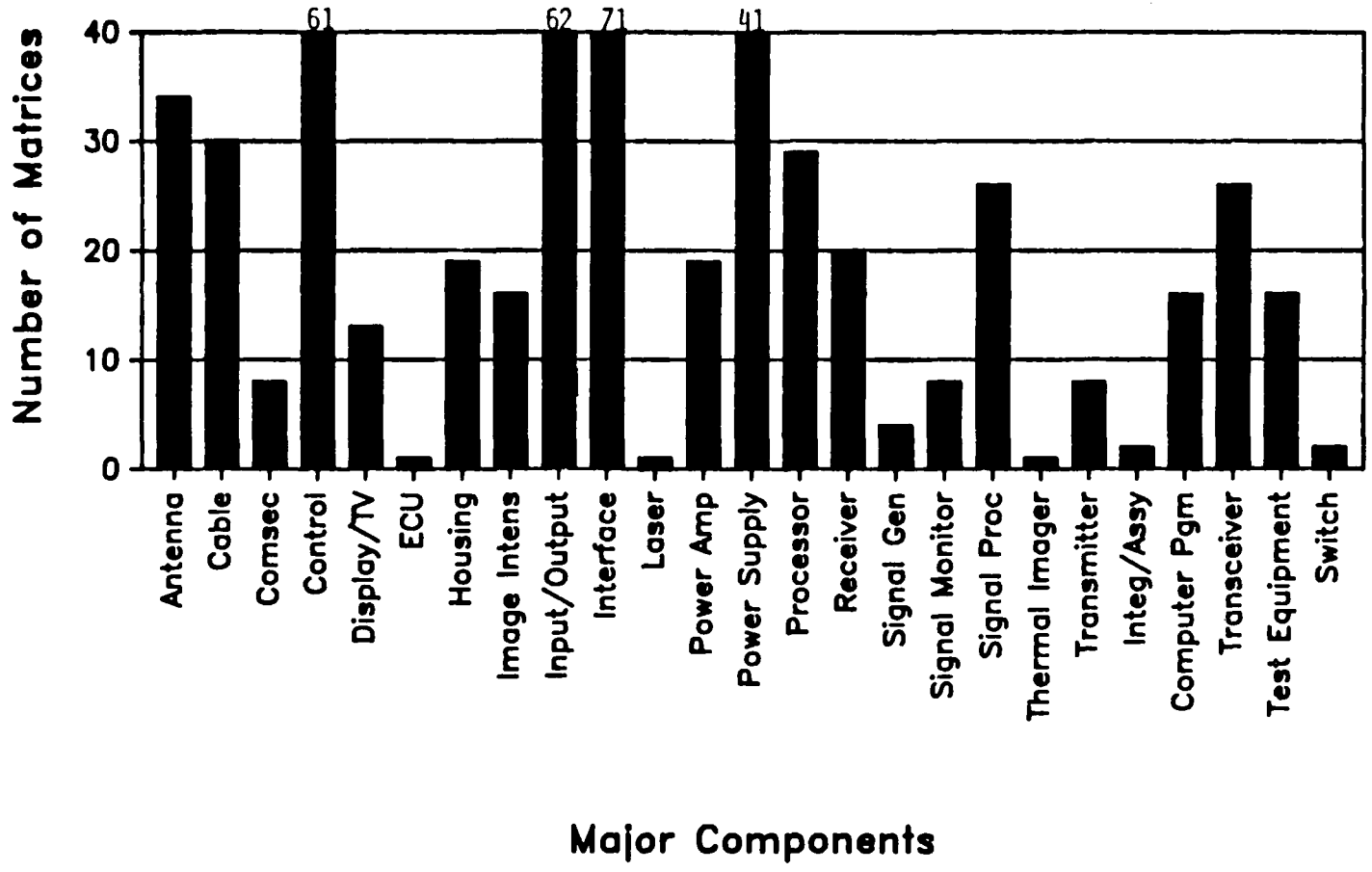
COMBINED COMPONENT COST MATRICES
TECH STARS/COMM STARS DATA BASES



MANAGEMENT CONSULTING & RESEARCH,INC.

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POINTS OF CONTACT

- TECH STARS (CONTRACT NUMBER DAAK21-84-C-0087)

  - COTR: MR. MICHAEL LOUBE (AMDEL-RM-CA), (202) 394-2826
    POC: MR. RICHARD O'SULLIVAN (AMDEL-RM-CA), (202) 394-2826
    U.S. ARMY ERADCOM, ADELPHI, MARYLAND

- COMM STARS (CONTRACT NUMBER MDA903-84-C-0491)

  - COTR (CURRENT): MR. ROBERT HUNT (CACC-VE), (202) 697-0303
    COTR (FORMER): MR. ROBERT YOUNG (CACC-AM), (202) 695-0266
    U.S. ARMY COST AND ECONOMIC ANALYSIS, THE PENTAGON

  - POC: MR. HOWARD FINE (AMSEL-CP-CA), (201) 544-4575
    U.S. ARMY CECOM, FT. MONMOUTH, NEW JERSEY

SYSTEM SUMMARY - COST MATRIX

PAGE 1

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TECH STARS

SYSTEM SUMMARY: COST-MATRIX

SYSTEM/COMPONENT: AN/AVS-6(V) ID#: 10042

C	CBS#	LCP	B#	CTR/LAB NUM	CONSTANT $ TOTAL COST	YR	FIRST UNIT COST	SLOPE	QUANT	LT	SOURCE CODE	EPC	FN#
U	2.01	4	1	7	2323050	3	0	0.0	0	0	CR	0	135
U	2.02	4	1	7	14280664	3	29882	92.0	1111	0	CR	0	136
U	2.04	4	1	7	35215	3	0	0.0	0	0	CR	0	133
U	2.07	4	1	7	2493319	3	0	0.0	0	0	CR	0	132
U	2.S1	4	1	7	2528534	3	0	0.0	0	0	CR	0	132
U	2.S2	4	1	7	19132248	3	40034	92.0	1111	0	CR	0	134

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SYSTEM SUMMARY – TECHNICAL PARAMETERS

******UNCLASSIFIED******

TECH STAPS

SYSTEM SUMMARY: TECHNICAL PARAMETERS

ID#: 10042 SYSTEM/COMPONENT: AN/AVS-6(V)

WBS#: 09.00.00 WBS NOMENCLATURE: NIGHT VISION: IMAGE INTENSIF

C	PARAMETER	UNIT	VALUE	FN#	C	PARAMETER	UNIT	VALUE	FN#
U	MAGNIFICATION	TIMES	1	0					0
U	FIELD OF VIEW	DEG	40	0					0
U	BRIGHTNESS GAIN	TIMES	2000	0					0
U	RECEIVER	QTY	0	0					0
U	PROCESSOR	QTY	0	0					0
U	POWER SUPPLY	QTY	0	0					0
U	DISPLAY	QTY	0	0	U	POWER CONSUMPT	WATTS	.3	0
U	I.I. TUBE	QTY	2	0	U	HOUSING	TYPE	FRAME	0
U	TUBE GENERATION	LEVEL	3	0	U	WIDTH	IN	4.75	0
U	I.R. DIODE	Y/N	N	0	U	DEPTH	IN	4.37	0
U	MOUNT	TYPE	HELMET	0	U	HEIGHT	IN	3.5	0
U	I.I ASSY	QTY	1	0	U	WEIGHT	LBS	1.5	0
				0		EMI/EMC	Y/N		0
				0		TEMPEST	Y/N		0
				0		NBC HARDENED	Y/N		0
				0	U	MTBF	HRS	1500	0
				0		MTTR	MIN		0
				0		DEPLOY ENVIRON	TYPE	AIRBORNE	0
				0		PARTS COUNT	QTY		0
				0		GATE COUNT	QTY		0

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COMM STARS SYSTEM LIST

RADIO

AFATDS
AN/ARC-115A
AN/ARC-186
AN/ARC-199
AN/ASN-128
AN/FSC-78
AN/FSC-79
AN/GRC-103(V)4
AN/GRC-144(V)3/4
AN/GRC-193
AN/GRC-213;AN/PRC-104A
AN/GSC-52(V)2
AN/GSG-10(V) TACFIRE
AN/MSC-60
AN/PRC-70
AN/PRC-77
AN/PRC-113(V)1
AN/PRC-113(V)3
AN/PRC-170(V)1
AN/TRC-170(V)2
AN/TRC-170(V)3
AN/TRC-173
AN/TRC-175
AN/TRQ-35
AN/TSC-85A
AN/TSC-99
AN/TSQ-129 PLRS
AN/VRC-46
AN/VSC-7
GPS-MAGNAVOX
GPS-ROCKWELL
PLRS/JTIDS Hybrid (PJH)
SINCGARS-V-CE
SINCGARS-V-ITT

SWITCH

AN/GYC-7
AN/TTC-38(V)1
AN/TTC-38(V)2
AN/TTC-39(V)2
AN/TTC-39(V)3
AN/TTC-39(XV)
AN/TTC-41(incl SB-3614)
AN/TTC-42
AN/TYC-16
AN/TYC-39(V)1
SB-3865

CONTROL

AN/TSQ-84A
AN/TSQ-111(V)1

LINE TERMINAL

AN/GXC-7A
AN/PSG-2B
AN/PSG-5
AN/UGC-74A(V)3
AN/UGC-74A(V)4
AN/UGC-137(V)2
OA-8990/P
SRT
TDF

INTERFACE

AN/IFM-101A
C-10414/ARC
DGM FAMILY
FOTS(LH)
HEAD
KY-883/GSC

COMPUTER

AN/GYK-29 BCS
AN/UYK-19A
AN/UYQ-19(V) p/o MCS
AN/UYQ-30 p/o MCS
CP-1516/ASQ

TMDE

AN/USM-410
SG-1139/G
SG-1219/U

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TECH STARS SYSTEM LIST

DATA LINK

AN/AKT-18B;AN/TKQ-2B
AN/TYQ-3A
MICNS
JSTARS

ELECTRO-OPTICAL

AN/AAS-32
AN/GVS-5
AN/PAQ-4
AN/PVS-6(MELIOS)
CO_2 LASER RANGEFINDER
STINGRAY

EW-AREA SUPPORT

AN/ALQ-151(V)2
AN/MLQ-34
AN/TLQ-17A
AN/TRQ-32
AD EXJAM
EH-1X
EH-60A
VHF APPLIQUE JAMMER

EW-SELF PROTECT

AN/ALQ-126B
AN/ALQ-136(V)1
AN/ALQ-144
AN/ALQ-147A(V)1/2
AN/ALQ-156
AN/ALQ-162
AN/ALR-67
AN/APR-39(V)2
AN/APR-44(V)1
AN/APR-44(V)2
AN/AVR-2
ADEWS
HF-SNAP
P-SNAP
SNAP-1

EW-SIGINT

AN/ARW-83
AN/PRD-10
AN/TSQ-105(V)4
AN/TSQ-114
AN/TSQ-114A
AN/TSQ-114B
AQL
CHAALS
GUARDRAIL/CS
IMPROVED GUARDRAIL
RECS
QUICKLOOK II
TCAC

IDENTIFICATION

AN/APX-100(V)
AN/PPN-19
AN/PPX-3
AN/TPX-46(V)7
HAIDE

NV-IMAGE INTENSIFYING

AN/AVS-6
AN/PVS-4
AN/PVS-5
AN/TVS-5
AN/VVS-2

NV-THERMAL IMAGING

AN/AAS-36
AN/AAS-38
AN/PAS-7/7A
AN/VAS-3 DTV
AN/VSG-2
RPV FMPS
THERMAL WEAPON SIGHT

PIP

AN/APX-100 TIP A PIP
AN/PPX-3 TIP A PIP
AN/TPQ-37 TWT PIP
AN/TPX-46(V)1-6 TIP A PIP
AN/TPX-46(V)7 TIP A PIP
TCAC INTERFACE PIP
TEAM PACK ENHANCEMENT PIP
QUICKLOOK II COCKPIT & DISPLAY PIP

RADAR

AN/APS-94F
AN/PPS-15
AN/TPQ-36
AN/TPQ-37
AN/TPS-59
AN/TPS-63
AN/UPD-7

SENSOR

AN/MSQ-103A
AN/MSQ-103A NETTING
AN/TRS-2(V)
PWAAS

END

FILMED

DTIC