Systematic Steps to Effective Database Development

Overview

- USCM Background
- Data Collection Process
- Normalization Process
- Data Package
- Automated Database
- Summary

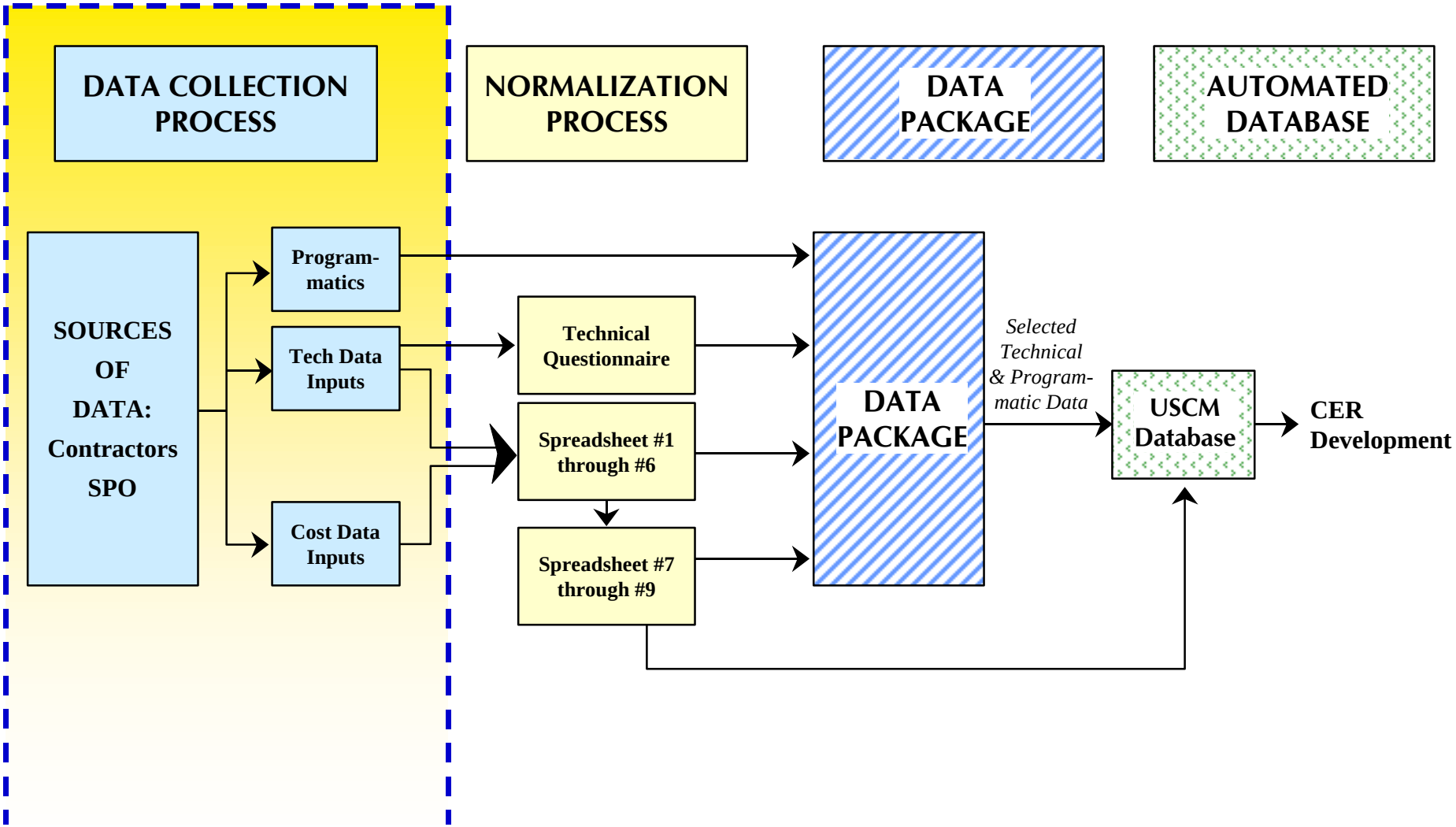
Unmanned Space Vehicle Cost Model (USCM) Database Development

- USCM provides CERs for estimating the costs of Earth-orbiting, unmanned space vehicle programs
- Database used to develop CERs consists of military, NASA, and commercial satellite programs
- First edition to fifth edition database grew from 12 to 32 satellite programs
- Seventh edition published in 1994 supplemented database with 11 satellite programs
- Database is managed by the Air Force Space and Missile Systems Center/FMC at Los Angeles AFB, California

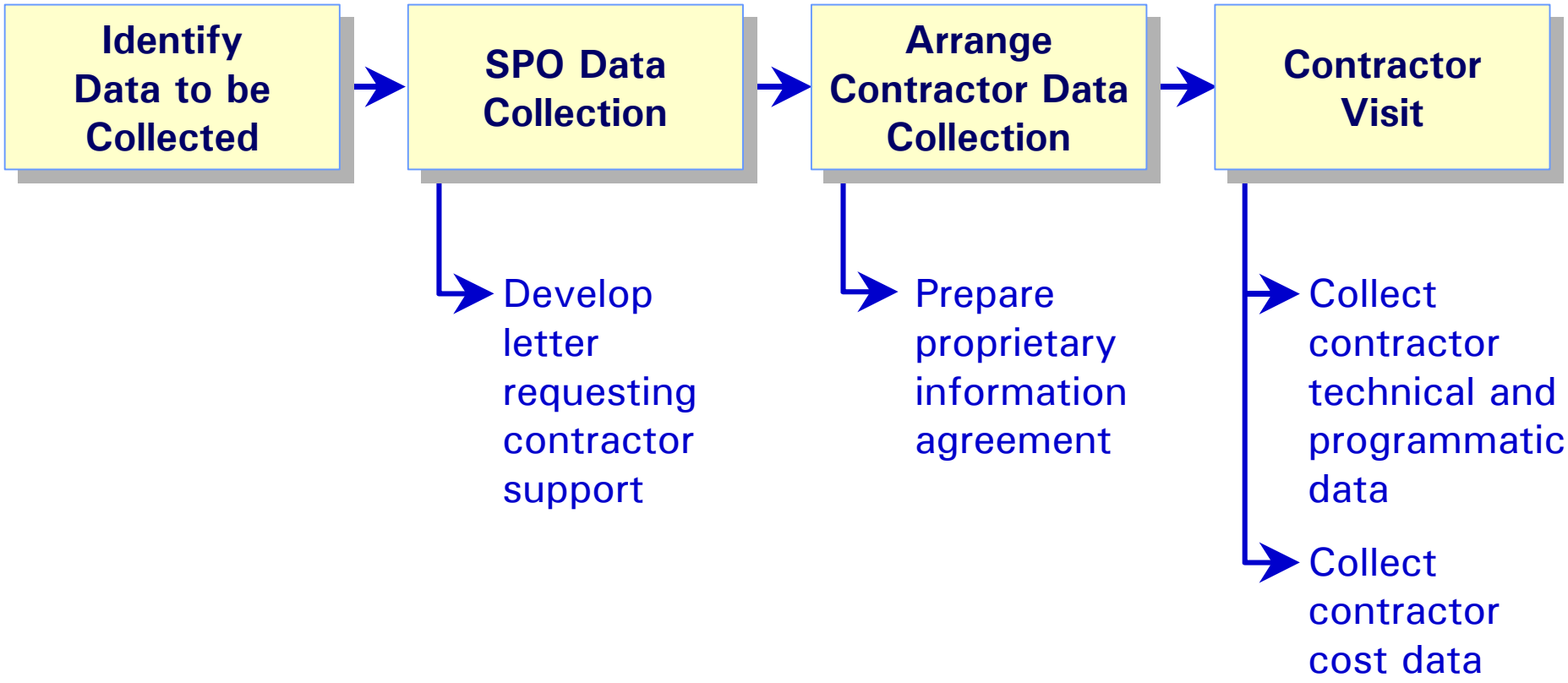
Background Database History

1969 First Edition	1971 Phase I Update	1972 Phase II Update	1973 Second Edition	1975 Third Edition	1977 Interim Report	1978 Fourth Edition	1981 Fifth Edition	1988 Sixth Edition	1994 Seventh Edition
MILITARY									
VELA VASP IDCSP IDCSP/A TACSAT	VELA VASP IDCSP IDCSP/A TACSAT DSP I	VELA VASP IDCSP IDCSP/A TACSAT DSP I DSCS II	VELA VASP IDCSP IDCSP/A TACSAT DSP I DSCS II	VELA VASP IDCSP IDCSP/A TACSAT DSP I DSCS II DSPII 5-12 DMSP 5D-1 P72-2 S3	VELA VASP IDCSP IDCSP/A TACSAT DSP I DSCS II DSPII 5-12 DMSP 5D-1 P72-2 S3 NATO III	VELA VASP IDCSP IDCSP/A TACSAT DSP I DSCS II DSPII 5-12 P72-2 S3 NATO III	VELA VASP IDCSP IDCSP/A TACSAT DSP I DSCS II DSPII 5-12 DMSP 5D-1 P72-2 S3 NATO III P78-1 P78-2 GPS-1 FLTSAT 1-5	IDCSP TACSAT S3 NATO 3 P78-1 DMSP 5D-1 GPS 9-11 FLTSAT 6-8 DSCS 1 & 2 DSCS 4-7	TACSAT DSPII 5-12 P72-2 S3 NATO 3 P78-1 P78-2 DMSP 5D-1 DMSP 5D-2 GPS 1-8 GPS 9-11 GPS 13-40 FLTSAT 1-5 FLTSAT 6-8 CRRES DSCS 1 & 2 DSCS 4-7 DSCS 8-14 DSP 18-22
NASA									
OGO SYNCOM LUNAR ORB ATS A (M/G) ATS B, C (S/S)	OGO SYNCOM LUNAR ORB ATS A (M/G) ATS B, C (S/S) ATS D, E (S/S) OAO TIROS M	OGO SYNCOM LUNAR ORB ATS A (M/G) ATS B, C (S/S) ATS D, E (S/S) OAO TIROS M	OGO SYNCOM LUNAR ORB ATS A (M/G) ATS B, C (S/S) ATS D, E (S/G) OAO TIROS M NIMBUS A, B, C NIMBUS E, F ERTS A, B	SYNCOM LUNAR ORB ATS A (M/G) ATS B, C (S/S) ATS D, E (S/G) TIROS M NIMBUS E, F ERTS A, B SMS 1-3 OSO I ATS F AE	SYNCOM LUNAR ORB ATS A (M/G) ATS B, C (S/S) ATS D, E (S/G) TIROS M NIMBUS E, F ERTS A, B SMS 1-3 OSO I ATS F AE	SYNCOM LUNAR ORB ATS A (M/G) ATS B, C (S/S) ATS D, E (S/G) TIROS M NIMBUS E, F ERTS A, B SMS 1-3 OSO I ATS F AE HEAO	SYNCOM LUNAR ORB ATS A (M/G) ATS B, C (S/S) ATS D, E (S/G) TIROS M NIMBUS E, F ERTS A, B SMS 1-3 OSO I ATS F AE HEAO	ATS F OSO I AE TDRSS	SMS 1-3 OSO I AE TDRSS
COMMERCIAL									
INTELSAT III	INTELSAT III	INTELSAT III	INTELSAT III	INTELSAT III INTELSAT IV	INTELSAT III INTELSAT IV	INTELSAT III INTELSAT IV MARISAT	INTELSAT III INTELSAT IV MARISAT	INTELSAT IV INTELSAT V-A MARISAT	INTELSAT IV MARISAT

USCM7 Database Development



Major Data Collection Steps



Identify Data to be Collected

- **Identify possible spacecraft that add the most value to the database**
- **Several criteria should be considered and prioritized**
- **Sample selection criteria**
  - Percent complete of the program
  - Future estimating needs
  - New technology
  - Availability of data
  - Sensitivity of data
  - Magnitude of data

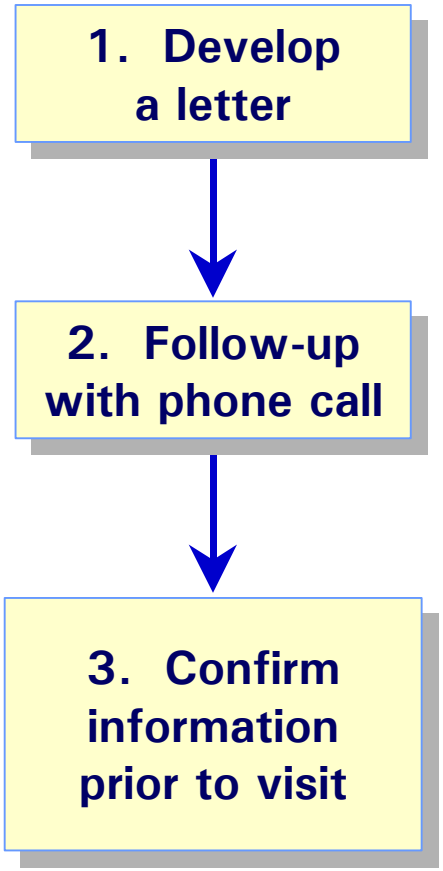
SPO Data Collection

- Present briefing to key SPO personnel
- Provide a thorough overview of the scope of the data collection
- Request the SPO s cooperation and assistance
- Review all concerns if the SPO declines to assist
- Identify benefits to the SPO
- Impact to the SPO and contractor will be kept at a minimum
- Collect all information available at the SPO
- Offer to do all the work

SPO Data Collection Data Checklist

- Pertinent technical and management reviews
- Other pertinent technical material
- Contract structure and values
- Pertinent schedules
- CDRL list
- Pertinent programmatic history/status
- Current cost reports (CPRs, functional cost hour report, etc.)
- Original proposals
- Subcontractor information
- Mass properties report
- WBS dictionary
- Statement of work

Arrange Contractor Data Collection



- **Develop a letter requesting a contractor visit**
  - Reviewed by Procurement Contracting Officer (PCO)
  - Prepared for signature by the program manager
- **Follow-up letter with a preliminary telephone conversation**
  - Obtain name and number of contractor POC
  - Discuss requirements for a proprietary information agreement
  - Make an appointment for the first meeting
- **Confirm information prior to visit**
  - Meeting agenda
  - Team members
  - Data requests

Contractor Visit

- Team should be well organized
- Each member should understand the purpose and scope
- Team should be kept to a reasonable size
- Brief contractor personnel on the purpose and scope
- Follow the agenda
- Judiciously manage your time

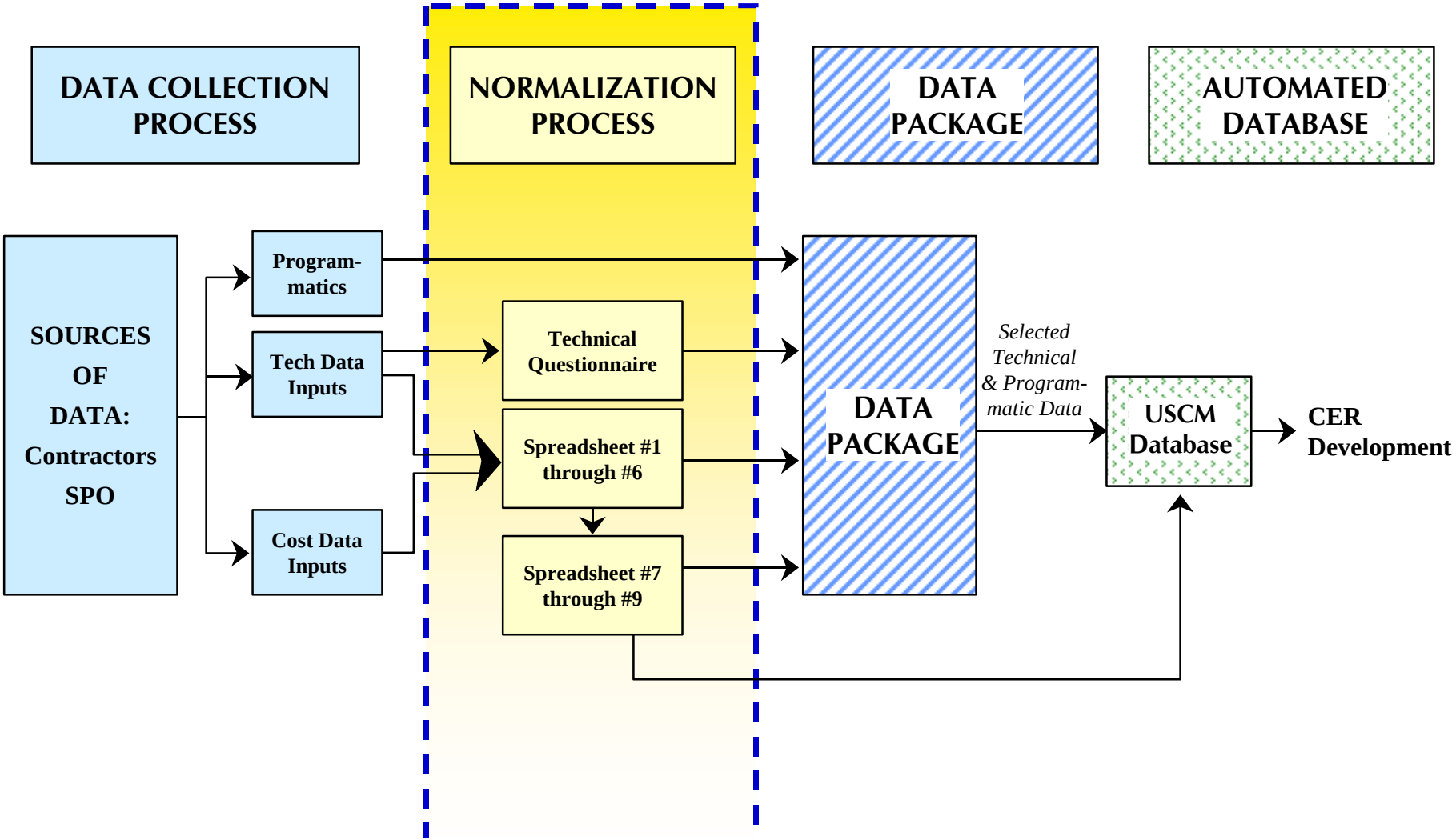
Collect Technical and Programmatic Data

- Functional, physical, and technical descriptions for each component
- Mass properties report at various milestones
- Technical questionnaire
- Contract structure and scope of work
- Engineering change proposals and contract modifications
- Identify areas which experienced schedule delays and cost overruns
- Detailed program schedules at various milestones

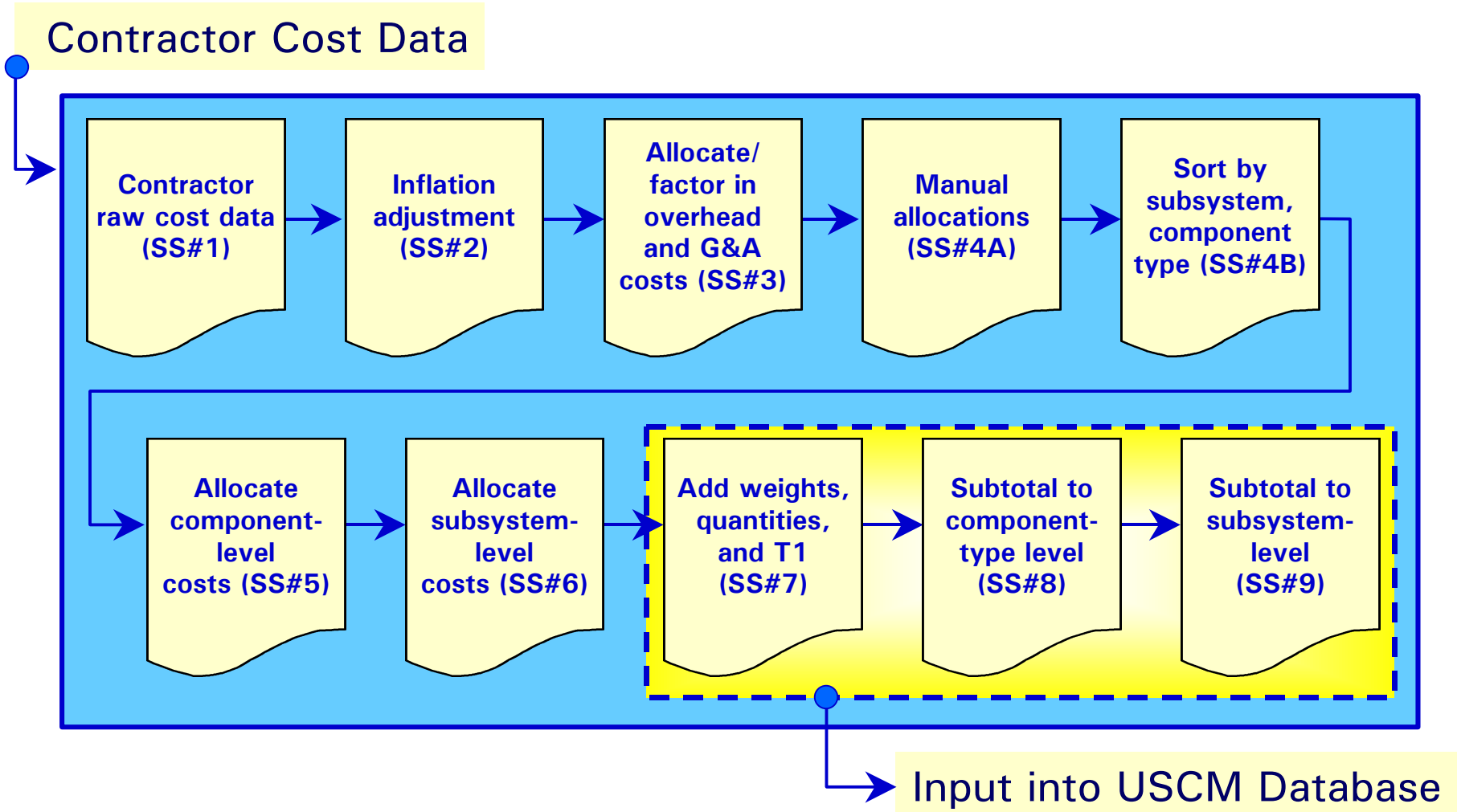
Helpful Hints

- Minimize impact on contractor by doing your homework
- Coordinate all trips with the contracting officer
- Take a Blue Suit on the data collection
- Take an example data package to the contractor s plant
- Provide a copy of the finished product to the contractor

USCM7 Database Development



Spreadsheet Normalization



Normalization Spreadsheets

- **Spreadsheet 1: Raw Data Input**
  - Enter all relevant contractor cost accounts
  - Break out cost by function
  - Analyze nonrecurring and recurring split
  - Reconcile contractor WBS with USCM WBS
  - Allocate cost to proper accounts
  - Ensure proper allocation of material accounts
  - Match cost accounts with technical data
  - Develop list of questions for contractor
  - Perform estimates-to-complete if required
- **Spreadsheet 2: Inflation Adjustment**
  - Perform midpoint analysis
  - Use current inflation indices
  - Inflate cost to base year of database

Normalization Spreadsheets (Cont.)

- **Spreadsheet 3: Allocate/Factor in Overhead and G&A Costs**
  - Often included in Spreadsheet 1
  - Combine costs into one row for each account
- **Spreadsheet 4: Manual and Component-Type Allocations**
  - Allocate accounts that are not spread proportionally
  - Piece-parts/material allocations
  - Sort by subsystem, component, and component type
- **Spradsheet 5: Component-Level Allocations**
  - Allocate accounts that are spread proportionally
- **Spreadsheet 6: Subsystem-Level Allocations**
  - Allocate accounts that are spread proportionally

Normalization Spreadsheets (Cont.)

- **Spreadsheet 7: Augment with Weights and Quantities**
  - Enter unit weight for each component
  - Enter quantity for each component
  - Calculate T1 cost for each component
- **Spreadsheet 8: Component Subtotals**
  - Sum weight to component suite total
  - Calculate T1 for each component suite
- **Spreadsheet 9: Subsystem Subtotals**
  - Sum weight to subsystem total
  - Calculate T1 for each subsystem

SPREADSHEET # 1: RAW DATA
FY1989-Actual $

SPACECRAFT: XXXXXXX
CONTRACTOR: XXX
SPACECRAFT QTY: 1
LAUNCH VEHICLE: SHUTTLE
DRY SC WEIGHT: XX,XXX LB

CONTRACT AWARD: 1978
FIRST LAUNCH: APRIL 9
RAW DATA $ YEAR: 1989

00 ESCALATION INDEX: 0.81301
3020 ESCALATION INDEX: 0.86133

USCM Categories

Contractor Categories

Qty & Weight columns not used until SS7

Inflation factors from "INPUT" worksheet

SUBSYSTEM	COMP TYPE	COMPONENT	ACCNT ID	FUNCT	ACCNT NAME	QTY	WEIGHT	NONREC	TOT NR	REC	TOT REC
ADCS	SENSOR	FH STAR TRAKKER	NGGFACFHMG	POD	MANAGEMENT			2,624	2,624		0
ADCS	SENSOR	FH STAR TRAKKER	NGGFACFHMG	PIO	MANAGEMENT			599	599		0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGED	EOD	DESIGN & ANALYSIS			990	990		0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGED	EIO	DESIGN & ANALYSIS			180	180		0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGEQ	SLD	SUBCONTRACT TECH SUPT			33,126	33,126		0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGEQ	SOD	SUBCONTRACT TECH SUPT			2,294	2,294		0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGEQ	SIO	SUBCONTRACT TECH SUPT			62,136	62,136		0
ADCS	SENSOR	RATE GYRO / IRU	RGGFACRGFR	MOD	REWORK				0	16	16
ADCS	SENSOR	RATE GYRO / IRU	RGGFACRGFR	MIO	REWORK				0	1,469	1,469
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGMG	POD	MANAGEMENT			5,441	5,441		0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGMG	PIO	MANAGEMENT			976	976		0
AGE	MECH / ELEC	MECH / ELEC	RGGFAIDTFI	MLD	TT & C SUSY AGE			16,256	16,256		0
AGE	MECH / ELEC	MECH / ELEC	RGGFAIDTFI	MMD	TT & C SUSY AGE			106	106		0
AGE	MECH / ELEC	MECH / ELEC	RGGFAIDTFR	MLD	TT & C SUSY AGE			17,284	17,284		0
AGE	MECH / ELEC	MECH / ELEC	RGGFAIDTFR	MOD	TT & C SUSY AGE			1,539	1,539		0
AGE	MECH / ELEC	MECH / ELEC	RGGFAIDTFR	MIO	TT & C SUSY AGE			35,797	35,797		0
AGE	ALLOCATE	ALLOCATE	RGGFAIDTMG	PLD	ALLOCATE			116,141	116,141		0
AGE	ALLOCATE	ALLOCATE	RGGFAIDTMG	POD	ALLOCATE			67,124	67,124		0
AGE	ALLOCATE	ALLOCATE	RGGFAIDTMG	PIO	ALLOCATE			253,740	253,740		0
AGE	TOOLING	TOOLING	RGGFEAAITL	TLD	TT & C SUSY AGE			30,665	30,665		0
AGE	TOOLING	TOOLING	RGGFEAAITL	TIO	TT & C SUSY AGE			61,368	61,368		0
AGE	MECH / ELEC	MECH / ELEC	NGGFEATTFR	MLD	TT & C SUSY AGE			11,475	11,475		0
AGE	MECH / ELEC	MECH / ELEC	NGGFEATTFR	MOD	TT & C SUSY AGE			8,022	8,022		0
AGE	MECH / ELEC	MECH / ELEC	NGGFEATTFR	MIO	TT & C SUSY AGE			24,042	24,042		0
AGE	TOOLING	TOOLING	NGGFEATTTL	TLD	TT & C SUSY AGE			1,019	1,019		0
AGE	TOOLING	TOOLING	NGGFEATTTL	TIO	TT & C SUSY AGE			2,040	2,040		0
STRUCTURE	ALLOCATE	ALLOCATE	NGGFPICQQA	QLD	QUALITY ASSURANCE			4,804	4,804		0
STRUCTURE	ALLOCATE	ALLOCATE	NGGFPICQQA	QOD	QUALITY ASSURANCE			302	302		0
STRUCTURE	ALLOCATE	ALLOCATE	NGGFPICQQA	QIO	QUALITY ASSURANCE			9,667	9,667		0
TT&C	CADH	CADH MODULE	NGGFTTCAEU	ELD	SPECIAL STUDIES			4,871	4,871		0

SPREADSHEET # 2: INFLATION

Inflated costs can be viewed concurrently with the raw, uninflated costs in adjacent columns.

SPACECRAFT: XXXXXXXXXX
CONTRACTOR: XXXXX
SPACECRAFT QTY: 1
LAUNCH VEHICLE: SHUTTLE
DRY SC WEIGHT: XX,XXX LB

CONTRACT AWARD: 1978
FIRST LAUNCH: APRIL
RAW DATA $ YEAR: 1989
SPREADSHEET $ YEAR: 1992

CALATION INDEX: 0.81301
CALATION INDEX: 0.86133

SUBSYSTEM	COMP TYPE	COMPONENT	ACCNT ID	FUNCT	ACCNT NAME	86$ NONREC	92$ NONREC	92$ TOT NR	88$ REC	92$ REC
AGE	TESTING	TESTING	NTAGMASTET	QLD	STRUCTURE AGE	64,619	79,481	79,481		0
AGE	TESTING	TESTING	NTAGMASTET	QMD	STRUCTURE AGE	18,073	22,230	22,230		0
AGE	TESTING	TESTING	NTAGMASTET	QOD	STRUCTURE AGE	21,600	26,568	26,568		0
AGE	TESTING	TESTING	NTAGMASTET	QIO	STRUCTURE AGE	140,614	172,955	172,955		0
AGE	MECH / ELEC	MECH / ELEC	NTAGMASTFR	MLD	STRUCTURE AGE	85,967	105,739	105,739		0
AGE	MECH / ELEC	MECH / ELEC	NTAGMASTFR	MMD	STRUCTURE AGE	140,003	172,204	172,204		0
AGE	MECH / ELEC	MECH / ELEC	NTAGMASTFR	MOD	STRUCTURE AGE	44,553	54,800	54,800		0
AGE	MECH / ELEC	MECH / ELEC	NTAGMASTFR	MIO	STRUCTURE AGE	212,527	261,408	261,408		0
AGE	ALLOCATE	ALLOCATE	NTAGMASTMG	PLD	ALLOCATE	65,776	80,904	80,904		0
AGE	ALLOCATE	ALLOCATE	NTAGMASTMG	POD	ALLOCATE	3,134	3,855	3,855		0
AGE	ALLOCATE	ALLOCATE	NTAGMASTMG	PIO	ALLOCATE	134,414	165,329	165,329		0
ADCS	SENSOR	FH STAR TRAKKER	NGGFACFHEQ	SLD	SUBCONTRACT TECH SUPT	8,561	10,530	10,530		0
ADCS	SENSOR	FH STAR TRAKKER	NGGFACFHEQ	SOD	SUBCONTRACT TECH SUPT	734	903	903		0
ADCS	SENSOR	FH STAR TRAKKER	NGGFACFHEQ	SIO	SUBCONTRACT TECH SUPT	16,821	20,690	20,690		0
ADCS	SENSOR	FH STAR TRAKKER	RGGFACFHES	ELD	ENGINEERING SUSTAINING		0	0	50,415	58,532
ADCS	SENSOR	FH STAR TRAKKER	RGGFACFHES	EOD	ENGINEERING SUSTAINING		0	0	4,990	5,793
ADCS	SENSOR	FH STAR TRAKKER	RGGFACFHES	EIO	ENGINEERING SUSTAINING		0	0	104,156	120,925
ADCS	SENSOR	FH STAR TRAKKER	RGGFACFHFR	MLD	REWORK		0	0	3,070	3,564
ADCS	SENSOR	FH STAR TRAKKER	RGGFACFHFR	MOD	REWORK		0	0	1,472	1,709
ADCS	SENSOR	FH STAR TRAKKER	RGGFACFHFR	MIO	REWORK		0	0	6,487	7,531
ADCS	SENSOR	FH STAR TRAKKER	NGGFACFHMG	POD	MANAGEMENT	2,624	3,228	3,228		0
ADCS	SENSOR	FH STAR TRAKKER	NGGFACFHMG	PIO	MANAGEMENT	599	737	737		0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGED	EOD	DESIGN & ANALYSIS	990	1,218	1,218		0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGED	EIO	DESIGN & ANALYSIS	180	221	221		0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGEQ	SLD	SUBCONTRACT TECH SUPT	33,126	40,745	40,745		0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGEQ	SOD	SUBCONTRACT TECH SUPT	2,294	2,822	2,822		0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGEQ	SIO	SUBCONTRACT TECH SUPT	62,136	76,427	76,427		0
ADCS	SENSOR	RATE GYRO / IRU	RGGFACRGFR	MLD	REWORK		0	0	645	749
ADCS	SENSOR	RATE GYRO / IRU	RGGFACRGFR	MMD	REWORK		0	0	884	1,026
ADCS	SENSOR	RATE GYRO / IRU	RGGFACRGFR	MOD	REWORK		0	0	16	19

SPREADSHEET # 3: FULLY BURDENED COSTS

SPACECRAFT: XXXXXXXXXX
CONTRACTOR: XXXXX
SPACECRAFT QTY: 1
LAUNCH VEHICLE: SHUTTLE
DRY SC WEIGHT: XX,XXX LB

CONTRACT AWARD: 1978
FIRST LAUNCH: APRIL 91
RAW DATA $ YEAR: 1989
SPREADSHEET $ YEAR: 1992

ESCALATION INDEX: 0.81301
ESCALATION INDEX: 0.86133

The FUNCT column now reads "TOT" because rows with like Account ID were summed.

SUBSYSTEM	COMP TYPE	COMPONENT	ACCNT ID	FUNCT	ACCNT NAME	QTY	WEIGHT	NONREC	TOT NR	REC	TOT REC
AGE	MECH / ELEC	MECH / ELEC	NTAGEAACEN	TOT	ADCS AGE			27,173	27,173	0	0
AGE	MECH / ELEC	MECH / ELEC	NTAGEAACEP	TOT	ADCS AGE			82,602	82,602	0	0
ADCS	SENSOR	ALLOCATE(FSS/CSS)	RTSAACSAEC	TOT	SUN SENSOR ASSEMBLY			0	0	420	420
ADCS	SENSOR	ALLOCATE(FSS/CSS)	RTSAACSAEF	TOT	SUN SENSOR ASSEMBLY			0	0	2,911	2,911
ADCS	SENSOR	ALLOCATE(FSS/CSS)	RTSAACSAEN	TOT	SUN SENSOR ASSEMBLY			0	0	15,153	15,153
ADCS	SENSOR	ALLOCATE(FSS/CSS)	RTSAACSAES	TOT	SUN SENSOR ASSEMBLY			0	0	74,287	74,287
AGE	TESTING	TESTING	NTAGEAACET	TOT	ADCS AGE			217,102	217,102	0	0
AGE	TESTING	TESTING	NTAGEAACFA	TOT	ADCS AGE			106,541	106,541	0	0
AGE	TESTING	TESTING	NTAGEAACFT	TOT	ADCS AGE			9,092	9,092	0	0
AGE	MECH / ELEC	MECH / ELEC	NTAGEAACKM	TOT	ADCS AGE			253,021	253,021	0	0
AGE	ALLOCATE	ALLOCATE	NTAGEAACMG	TOT	ADCS AGE			210,180			0
AGE	MECH / ELEC	MECH / ELEC	NTAGEAACMY	TOT	ADCS AGE			4,787			0
AGE	TESTING	TESTING	NTAGEAAIAT	TOT	AI&T SUBSYSTEM AGE			200,413			0
AGE	ALLOCATE	ALLOCATE	NTAGEAAIED	TOT	ALLOCATE			1,329,656			0
AGE	MECH / ELEC	MECH / ELEC	NTAGEAAIEJ	TOT	AI&T SUBSYSTEM AGE			149,468			0
AGE	MECH / ELEC	MECH / ELEC	NTAGEAAIKM	TOT	AI&T SUBSYSTEM AGE			805,789			0
AGE	ALLOCATE	ALLOCATE	NTAGEAAIMG	TOT	ALLOCATE			947,722			0
AGE	MECH / ELEC	MECH / ELEC	NTAGEAAIMY	TOT	AI&T SUBSYSTEM AGE			2,328,349	2,328,349	0	0
AGE	TOOLING	TOOLING	NTAGEAAITL	TOT	AI&T SUBSYSTEM AGE			391,654	391,654	0	0
AGE	ALLOCATE	ALLOCATE	NTAGEACAEN	TOT	ALLOCATE			167	167	0	0
AGE	TESTING	TESTING	NTAGEACAFT	TOT	COMM AGE			54	54	0	0
AGE	ALLOCATE	ALLOCATE	NTAGEACAMG	TOT	ALLOCATE			1,310	1,310	0	0
AGE	MECH / ELEC	MECH / ELEC	NTAGEACAMY	TOT	COMM AGE			27	27	0	0
AGE	TOOLING	TOOLING	NTAGEACATL	TOT	COMM AGE			8,542	8,542	0	0
AGE	ALLOCATE	ALLOCATE	NTAGEAEPED	TOT	ALLOCATE			94,297	94,297	0	0
AGE	ALLOCATE	ALLOCATE	NTAGEAEPEN	TOT	ALLOCATE			15,452	15,452	0	0
AGE	MECH / ELEC	MECH / ELEC	NTAGEAEPEP	TOT	EP& D SUBSYS AGE			2,385	2,385	0	0
ADCS	SENSOR	COARSE SUN SENSORS	NTSAACCSEU	TOT	SPECIAL STUDIES			389	389	0	0
ADCS	SENSOR	COARSE SUN SENSORS	NTSAACCSEX	TOT	ENGINEERING MODEL			7,245	7,245	0	0
ADCS	SENSOR	COARSE SUN SENSORS	RTSAACCSFA	TOT	FABRICATION ASSEMBLY & TEST			0	0	5,368	5,368
ADCS	SENSOR	COARSE SUN SENSORS	RTSAACCSFS	TOT	MANUFACTURING SUPPORT			0	0	1,428	1,428

These costs are the totals for the contractor WBS or Account ID.

SPREADSHEET # 4A: MANUAL ALLOCATIONS

SPACECRAFT: XXXXXXXXXX
CONTRACTOR: XXXXX
SPACECRAFT QTY: 1
LAUNCH VEHICLE: SHUTTLE
DRY SC WEIGHT: XX,XXX LB

CONTRACT AWARD: 1978
FIRST LAUNCH: APRIL 91
RAW DATA $ YEAR: 1989
SPREADSHEET $ YEAR: 1992

3600 ESCALATION INDEX: 0.81301
3020 ESCALATION INDEX: 0.86133

SUBSYSTEM	COMP TYPE	COMPONENT	ACCNT ID	FUNCT	ACCNT NAME	NONREC	TOT NR	REC	TOT REC
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGED	TOT	DESIGN & ANALYSIS	1,439	1,439	0	0
ADCS	SENSOR	RATE GYRO / IRU	NGGFACRGMG	TOT	MANAGEMENT	7,893	7,893	0	0
STRUCTURE	ALLOCATE	ALLOCATE	NGGFPICQQA	TOT	QUALITY ASSURANCE	18,171	18,171	0	0
TT&C	ANTENNA	HIGH GAIN ANTENNA	RGGFTTHGEN	TOT	ENGINEERING	0	0	7,520	7,520
TT&C	ANTENNA	HG ANTENNA DRIVE	NTSAACADTL	TOT	TOOLING & TEST EQUIP	304	304	0	0
ADCS	SENSOR	COARSE SUN SENSORS	RTSAACCSAA	TOT	ASSEMBLY INTEG. & TEST	0	0	6,943	6,943
ADCS	SENSOR	COARSE SUN SENSORS	[illegible]	[illegible]	ING & TEST EQUIPMENT FA	0	0	107	107
ADCS	SENSOR	COARSE SUN SENSORS	[illegible]	[illegible]	NG & TEST EQUIPMENT	7,628	7,628	0	0
STRUCTURE	OTHER	ALLOCATE(SAS/AS)	[illegible]	[illegible]	Y & LATCH ACTUATOR	825	825	0	0
STRUCTURE	OTHER	ALLOCATE(SAS/AS)	[illegible]	[illegible]	Y & LATCH ACTUATOR	0	0	84,638	84,638
STRUCTURE	OTHER	ALLOCATE(SAS/AS)	[illegible]	[illegible]	Y & LATCH ACTUATOR	59,784	59,784	32,919	32,919
STRUCTURE	OTHER	ALLOCATE(SAS/AS)	[illegible]	[illegible]	Y & LATCH ACTUATOR	240	240	0	0
ADCS	SENSOR	FINE SUN SENSORS	[illegible]	[illegible]	N & ANALYSIS	946	946	0	0
ADCS	SENSOR	FINE SUN SENSORS	[illegible]	[illegible]	NTRACT	205,373	205,373	452,323	452,323
ADCS	SENSOR	FINE SUN SENSORS	[illegible]	[illegible]	OOLING & TEST EQUIPMENT	276	276	0	0
ADCS	ALLOCATE	ACAD FIRMWARE	NTSAACFWTL	TOT	TOOLING & TEST EQUIPMENT	866	866	0	0
TT&C	ANTENNA	H G ANTENNA DRIVE	RTSAACHGEF	TOT	MANUFACTURING ENGINEERING	0	0	30,013	30,013
TT&C	ANTENNA	H G ANTENNA DRIVE	NTSAACHGEU	TOT	SPECIAL STUDIES	326	326	0	0
ADCS	SENSOR	3-AXIS MAGNETOMETER	NTSAACMEED	TOT	DESIGN & ANALYSIS	711	711	0	0
ADCS	SENSOR	3-AXIS MAGNETOMETER	NTSAACMETL	TOT	TOOLING & TEST EQUIPMENT	207	207	0	0
ADCS	RCS	MAGNETIC TORQUERS	NTSAACMTED	TOT	DESIGN & ANALYSIS	1,583	1,583	0	0
ADCS	RCS	MAGNETIC TORQUERS	NTSAACMTSC	TOT	SUBCONTRACT	345,781	345,781	580,238	580,238
ADCS	RCS	REACTION WHEEL ASSEMBLY	NTSAACRWED	TOT	DESIGN & ANALYSIS	3,915	3,915	0	0
ADCS	RCS	REACTION WHEEL ASSEMBLY	NTSAACRWSC	TOT	SUBCONTRACT	867,537	867,537	1,042,200	1,042,200
ADCS	RCS	REACTION WHEEL ASSEMBLY	[illegible]	[illegible]	TOOLING & TEST EQUIPMENT	1,144	1,144	0	0
ADCS	ALLOCATE	USER'S MANUAL	[illegible]	[illegible]	DOCUMENTATION & DOCU CONT	82,112	82,112	0	0
ADCS	SENSOR	ALLOCATE(FSS/CSS)	[illegible]	[illegible]	SUN SENSOR ASSEMBLY	0	0	420	420
ADCS	SENSOR	ALLOCATE(FSS/CSS)	[illegible]	[illegible]	SUN SENSOR ASSEMBLY	0	0	2,911	2,911
ADCS	SENSOR	ALLOCATE(FSS/CSS)	[illegible]	[illegible]	SUN SENSOR ASSEMBLY	0	0	15,153	15,153
ADCS	SENSOR	ALLOCATE(FSS/CSS)	[illegible]	[illegible]	SUN SENSOR ASSEMBLY	0	0	74,287	74,287
ADCS	DIGITAL ELECTRONICS	REACTION WHEEL ELECTRONICS	[illegible]	[illegible]	ASSEMBLY INTEGRATION & TEST	0	0	407,303	407,303

Manual allocations with parentheses indicate where the costs will be allocated. In this case the Solar Array Structure and Antenna structure, but not any other structure accounts.

These costs will be manually allocated to the Fine Sun Sensor and Course Sun Sensor accounts.

SPREADSHEET # 4B: SORT

SPACECRAFT: XXXXXXXXXX
CONTRACTOR: XXXXX
SPACECRAFT QTY: 1
LAUNCH VEHICLE: SHUTTLE
DRY SC WEIGHT: XX,XXX LB

CONTRACT AWARD: 1978
FIRST LAUNCH: APRIL 91
RAW DATA $ YEAR: 1989
SPREADSHEET $ YEAR: 1992

3600 ESCALATION INDEX: 0.81301
3020 ESCALATION INDEX: 0.86133

SUBSYSTEM	COMP TYPE	COMPONENT	ACCNT ID	FUNCT	ACCNT NAME	NONREC	TOT NR	REC	TOT REC
ADCS	SENSOR	3-AXIS MAGNETOMETER	NTSAACMEMG	TOT	MANAGEMENT	183,253	183,253	184,253	184,253
ADCS	SENSOR	3-AXIS MAGNETOMETER	NTSAACMEQA	TOT	QUALITY ASSURANCE	16,134	16,134	17,877	17,877
ADCS	SENSOR	3-AXIS MAGNETOMETER	NTSAACMETL	TOT	TOOLING & TEST EQUIPMENT	207	207	0	0
ADCS	SENSOR	COARSE SUN SENSORS	RTSAACCSAA	TOT	ASSEMBLY INTEG. & TEST	0	0	7,981	7,981
ADCS	SENSOR	COARSE SUN SENSORS	RTSAACCSTF	TOT	TOOLING & TEST EQUIPMENT	0	0	123	123
AD			NGGFACFHEQ	TOT	SUBCONTRACT TECH SUPT	32,123	32,123	0	0
AD			RGGFACFHES	TOT	ENGINEERING SUSTAINING	0			185,250
AD			RGGFACFHFR	TOT	REWORK	0			12,805
ADCS			NGGFACFHMG	TOT	MANAGEMENT	3,964			0
ADCS	SENSOR	FINE SUN SENSORS	NTSAACFSED	TOT	DESIGN & ANALYSIS	946			0
ADCS	SENSOR	FINE SUN SENSORS	NTSAACFSSC	TOT	SUBCONTRACT	205,373			319,980
ADCS	SENSOR	FINE SUN SENSORS	NTSAACFSTL	TOT	TOOLING & TEST EQUIPMENT	276			0
ADCS	SENSOR	RATE GYRO /			WORK	0	0	3,499	3,499
ADCS	SENSOR	RATE GYRO /			NAGEMENT	7,893	7,893	0	0
AGE	ALLOCATE	ALLOCATE			CS AGE	210,180	210,180	0	0
AGE	ALLOCATE	ALLOCATE	NTAGEAAIED	TOT	ALLOCATE	1,329,656	1,329,656	0	0
AGE	ALLOCATE	ALLOCATE	NTAGEAAIMG	TOT	ALLOCATE	947,722	947,722	0	0
EPS	GENERATION	SOLAR ARRAY DRIVE ASSY	RTSAACDAAA	TOT	ASSEMBLY INTEG. & TEST	0	0	393,616	393,616
EPS	GENERATION	SOLAR ARRAY DRIVE ASSY	RTSAACDAAT	TOT	TEST (ENVIRONMENTAL)	0	0	848	848
EPS	PCD	CABLE HARNESS	RTSAEPHAEF	TOT	MANUFACTURING ENGINEERI	0	0	342,198	342,198
EPS	PCD	CABLE HARNESS	NTSAEPHAEJ	TOT	ELECTRICAL DESIGN INTEGR/	333,448	333,448	0	0
EPS	PCD	CABLE HARNESS	RTSAEPHAEK	TOT	VERIFICATION	0	0	25,741	25,741
EPS	PCD	CABLE HARNESS	NTSAEPHAEL	TOT	INTERFACE ENGINEERING	6,322	6,322	0	0
IA&T	SYS TEST	ASSY INTEG TEST	NTSPAIDTAT	TOT	TEST (ENVIRONMENTAL)	1,720,480	1,720,480	9,704,649	9,704,649
IA&T	SYS TEST	ASSY INTEG TEST	RTSPAIDTE1	TOT	ENGINEERING MANAGEMENT	0	0	990,948	990,948

Sorted alphabetically by these first three columns.

These course sun sensor accounts increased by the amount manually allocated to them.

Blank row inserted between subsystems.

Spreadsheet # 5: COMPONENT LEVEL COST ALLOCATIONS

SPACECRAFT: XXXXXXXXXX
CONTRACTOR: XXXXX
SPACECRAFT QTY: 1
LAUNCH VEHICLE: SHUTTLE
DRY SC WEIGHT: XX,XXX LB

CONTRACT AWARD: 1978
FIRST LAUNCH: APRIL 91
RAW DATA $ YEAR: 1989
SPREADSHEET $ YEAR: 1992

3600 ESCALATION INDEX: 0.81301
3020 ESCALATION INDEX: 0.86133

"ALLOCATE" no longer appears in the Component column.

Costs after component allocations have taken place.

SUBSYSTEM	COMP TYPE	COMPONENT	ACCNT ID	FUNCT	ACCNT NAME	NONREC	TOT NR	REC	TOT REC
ADCS	ALLOCATE	ACAD FIRMWARE	NTSAACFWED	TOT	DESIGN & ANALYSIS	364,795	364,795	0	0
ADCS	ALLOCATE	ACAD FIRMWARE	NTSAACFWEK	TOT	VERIFICATION	195,132	195,132	0	0
ADCS	ALLOCATE	ACAD FIRMWARE	NTSAACFWEN	TOT	ENGINEERING	519,569	519,569	0	0
ADCS	A			TOT	DEVELOPMENT TEST	258,369	258,369	0	0
ADCS	A			TOT	SPECIAL STUDIES	8,802	8,802	0	0
ADCS	A			TOT	ENGINEERING DATA	10,563	10,563	0	0
ADCS	ALLOCATE	ACAD FIRMWARE	NTSAACFWFR	TOT	REWORK	90,031	90,031	0	0
ADCS	ALLOCATE	ACAD FIRMWARE	NTSAACFWKC	TOT	MATERIAL CONTROL				0
ADCS	ALLOCATE	ACAD FIRMWARE	NTSAACFWMC	TOT	FINANCIAL CONTROL	35			0
ADCS	ALLOCATE	ACAD FIRMWARE	NTSAACFWMG	TOT	MANAGEMENT	230			0
ADCS	ALLOCATE	ACAD FIRMWARE	NTSAACFWTD	TOT	TOOLING & TEST EQUIPMENT DSN	4			0
ADCS	ALLOCATE	ACAD FIRMWARE	NTSAACFWTL	TOT	TOOLING & TEST EQUIPMENT	866	866	0	0
ADCS	ALLOCATE	FIXED BASE TESTING	RTSAACFBEC	TOT	CONFIGURATION MANAGEMENT	0	0	377	377
ADCS	ALLOCATE	FIXED BASE TESTING	NTSAACFBED	TOT	DESIGN & ANALYSIS	3,246	3,246	0	0
ADCS	RCS	REACTION WHEEL ASSEMBLY	NTSAACRWEU	TOT	SPECIAL STUDIES	12,122	12,122	0	0
ADCS	RCS	REACTION WHEEL ASSEMBLY	RTSAACRWFA	TOT	FABRICATION ASSEMBLY & TEST	0	0	2,343	2,343
ADCS	SENSOR	3-AXIS MAGNETOMETER	NTSAACMEED	TOT	DESIGN & ANALYSIS	711	711	0	0
ADCS	SENSOR	3-AXIS MAGNETOMETER	RTSAACMEEN	TOT	ENGINEERING	0	0	382,933	382,933
AGE	TESTING	TESTING	NTAGMASTET	TOT	STRUCTURE AGE	456,507	456,507	0	0
AGE	TOOLING	TOOLING	NTAGEAAITL	TOT	AI&T SUBSYSTEM AGE	593,534	593,534	0	0
EPS	GENERATION	SOLAR ARRAYS	NTSAEPSATL	TOT	TOOLING & TEST EQUIPMENT	215,918	215,918	0	0
EPS	MPA	MODULAR POWER ASSEMBLY	NTSAEPMPTL	TOT	TOOLING & TEST EQUIPMENT	205,618	205,618	0	0
EPS	PCD	CABLE HARNESS	RTSAEPHAAA	TOT	ASSEMBLY INTEG. & TEST	0	0	991,235	991,235
EPS	PCD	CABLE HARNESS	RTSAEPHAAS	TOT	ASSEMBLY	0	0	204,555	204,555
EPS	PCD	CABLE HARNESS	NTSAEPHAAT	TOT	TEST (ENVIRONMENTAL)	2	2	0	0
EPS	PCD	CABLE HARNESS	NTSAEPHAAW	TOT	TEST SOFTWARE	7,839	7,839	0	0
IA&T	SYS TEST	ASSY INTEG TEST	NTSPAIDTAT	TOT	TEST (ENVIRONMENTAL)	1,720,480	1,720,480	9,704,649	9,704,649
IA&T	SYS TEST	ASSY INTEG TEST	RTSPAIDTE1	TOT	ENGINEERING MANAGEMENT	0	0	990,948	990,948

Spreadsheet # 6: SUBSYSTEM LEVEL ALLOCATIONS

SPACECRAFT: XXXXXXXXXX
CONTRACTOR: XXXXX
SPACECRAFT QTY: 1
LAUNCH VEHICLE: SHUTTLE
DRY SC WEIGHT: XX,XXX LB

CONTRACT AWARD: 1978
FIRST LAUNCH: APRIL 91
RAW DATA $ YEAR: 1989
SPREADSHEET $ YEAR: 1992

3600 ESCALATION INDEX: 0.81301
3020 ESCALATION INDEX: 0.86133

SUBSYSTEM	COMP TYPE	COMPONENT	ACCNT ID	FUNCT	ACCNT NAME	NONREC	TOT NR	REC	TOT REC
ADCS	RCS	THRUSTER 5 LB.	NTSARCTCQA	TOT	QUALITY ASSURANCE	24,811	24,811	0	0
ADCS	RCS	THRUSTER 5 LB.	NTSARCTCTL	TOT	TOOLING & TEST EQUIPMENT	20,911	20,911	0	0
ADCS	RCS	100 LB. THRUSTERS	RTSARCTBMS	TOT	SUBCONTRACT ADDMINISTRATION	8,252	8,252	17,394	17,394
ADCS	RCS	100 LB. THRUSTERS	NTSARCTBQA	TOT	QUALITY ASSURANCE	14,718	14,718	20,169	20,169
ADCS	RCS	100 LB. THRUSTERS	NTSARCTBTL	TOT	TOOLING & TEST EQUIPMENT	9,171	9,171	0	0
ADCS	RCS	MAGNETIC TORQUERS	NTSAACMTED	TOT	DESIGN & ANALYSIS	2,000	2,000	0	0
ADCS	RCS	MAGNETIC TORQUERS	RTSAACMTEN	TOT	ENGINEERING	0	0	205,224	205,224
ADCS	RCS	MAGNETIC TORQUERS	RTSAACMTES	TOT	ENGINEERING SUSTAINING	0	0	345,469	345,469
AGE	MECH / ELEC	MECH / ELEC	NTAGEAACEN	TOT	ADCS AGE	41,180	41,180	0	0
AGE	MECH / ELEC	MECH / ELEC	NTAGEAACEP	TOT	ADCS AGE	125,179	125,179	0	0
AGE	MECH / ELEC	MECH / ELEC	NTAGEAACKM	TOT	ADCS AGE	383,442	383,442	0	0
AGE	MECH / ELEC	MECH		T	ADCS AGE	7,255	7,255	0	0
AGE	MECH / ELEC	MECH		T	AI&T SUBSYSTEM AGE	226,513	226,513	0	0
AGE	MECH / ELEC	MECH		T	AI&T SUBSYSTEM AGE	174,689	174,689	0	0
EPS	GENERATION	SOLAR		T	ASSEMBLY INTEG. & TEST	0	0	393,616	393,616
EPS	GENERATION	SOLAR		T	TEST (ENVIRONMENTAL)	0	0	848	848
EPS	GENERATION	SOLAR		T	CONFIGURATION MANAGEMENT	0	0	3,981	3,981
EPS	GENERATION	SOLAR ARRAY DRIVE ASSY	NTSAACDAED	TOT	DESIGN & ANALYSIS	793,622	793,622	0	0
EPS	GENERATION	SOLAR ARRAY DRIVE ASSY	RTSAACDAEF	TOT	MANUFACTURING ENGINEERING	0	0	27,372	27,372
EPS	GENERATION	SOLAR ARRAY DRIVE ASSY	RTSAACDAEN	TOT	ENGINEERING	0	0	142,435	142,435
EPS	PCD	CABLE HARNESS	NTSAEPHAEL	TOT	INTERFACE ENGINEERING	6,322	6,322	0	0
EPS	PCD	CABLE HARNESS	NTSAEPHAEN	TOT	ENGINEERING	751,943	751,943	136,587	136,587
EPS	PCD	CABLE HARNESS	NTSAEPHAEP	TOT	PRODUCT DESIGN	45,353	45,353	0	0
EPS	PCD	CABLE HARNESS	RTSAEPHAES	TOT	ENGINEERING SUSTAINING	0	0	1,541,526	1,541,526
IA&T	I & A	ASSY INTEG TEST	RTSPAIDTF1	TOT	INTEGRATION RETURNS	0	0	645,758	645,758
IA&T	I & A	ASSY INTEG TEST	RTSPAIDTLO	TOT	LAUNCH OPERATIONS	0	0	7,243,295	7,243,295
IA&T	I & A	ASSY INTEG TEST	NTSPAIDTMG	TOT	MANAGEMENT	10,857	10,857	0	0
IA&T	I & A	INTEG PLANNING LOGISTICS	NTSPAIDLED	TOT	DESIGN & ANALYSIS	56,377	56,377	0	0

"ALLOCATE" no longer appears on the spreadsheet, all allocations have taken place.

Spreadsheet # 7: COMPONENT WEIGHT / QUANTITIES

SPACECRAFT: XXXXXXXXXX
CONTRACTOR: XXXXX
SPACECRAFT QTY: 1
LAUNCH VEHICLE: SHUTTLE
DRY SC WEIGHT: XX,XXX LB

CONTRACT AWARD: 1978
FIRST LAUNCH: APR
RAW DATA $ YEAR: 1989
SPREADSHEET $ YEAR: 1992

ON INDEX: 0.81301
ON INDEX: 0.86133

All rows are summed into one line for each component.

Hardware component quantity and weight per spacecraft are entered here.

Account ID and Account Name no longer appear on spreadsheet.

Theoretical first unit component cost values based upon number of components per space vehicle appear in the T1 column.

Non-hardware accounts require quantity of 1, but no weight entry.

SUBSYSTEM	COMP TYPE	COMPONENT	ACCNT ID	FUNCT	ACCNT NAME	QTY	WEIGHT	NONREC	REC	T1
ADCS	DIGITAL ELECTRONICS	REACTION WHEEL ELECTRONICS		TOT		4	19	2,226,563	2,725,536	754,996
ADCS	RCS	100 LB. THRUSTERS		TOT		4	4.025	381,776	590,794	163,655
ADCS	RCS	MAGNETIC TORQUERS		TOT		3	95.2	616,797	1,313,253	474,826
ADCS	RCS	PROPELLANT DISTRIBUTION				1	206.6	952,596	103,276	103,276
ADCS	SENSOR	3-AXIS MAGNETOMETER				2	2.75	297,509	2,632,936	1,385,756
ADCS	SENSOR	FINE SUN SENSORS				2	1.75	375,988	1,180,183	621,149
AGE	MECH / ELEC	MECH / ELEC				1		8,150,626	0	0
AGE	TESTING	TESTING				1		11,879,333	0	0
AGE	TOOLING	TOOLING				1				0
EPS	GENERATION	SOLAR ARRAY DRIVE ASSY		TOT		2	35			33,155
EPS	GENERATION	SOLAR ARRAYS		TOT		8	41			88,498
EPS	PCD	CABLE HARNESS		TOT		1	630.4			56,518
EPS	PCD	ELEC INTEG ASSY		TOT		1	44.3			63,953
EPS	PCD	INSTRUMENT SWITCHING UNIT		TOT		1	39.1			77,088
IA&T	I & A	ASSY INTEG TEST				1				89,054
IA&T	SYS TEST	ASSY INTEG TEST				1				70,676
LOOS	LOOS	LOOS				1		0	9,573,736	9,573,736
PROG LEVEL	DATA	FUNCTIONAL				1		2,695,592	2,458,373	2,458,373
PROG LEVEL	ENGINEERING	FUNCTIONAL				1		32,861,353	22,449,810	22,449,810
SOFTWARE	SOFTWARE	SOFTWARE		TOT		1		13,719,020	1,335,523	1,335,523
STRUCTURE	OTHER	ANTENNA STRUCTURES		TOT		1	268	3,151,062	4,560,912	4,560,912
STRUCTURE	OTHER	SOLAR ARRAY STRUCTURE		TOT		2	450.05	5,382,943	14,887,131	7,835,332
STRUCTURE	OTHER	SUPPORT STRUCTURES		TOT		1	3152	11,810,225	9,682,032	9,682,032
THERMAL	ACTIVE	HEAT PIPES		TOT		1	61.9	915,761	3,714,226	3,714,226
THERMAL	PASSIVE	INSULATION / PAINT		TOT		1	279.2	5,306,535	65,916	65,916
TT&C	ANTENNA	HIGH GAIN ANTENNA		TOT		1	15	679,734	1,163,126	1,163,126
TT&C	ANTENNA	OMNI ANTENNA		TOT		2	1.1	284,880	41,286	21,730

Spreadsheet # 8: COMPONENT TYPE TOTALS

SPACECRAFT: XXXXXXXXXX
CONTRACTOR: X
SPACECRAFT Q
LAUNCH VEHIC
DRY SC WEIGHT: XX,XXX LB

CONTRACT AWARD:
FIRST LAUNCH:
RAW DATA $ YEAR:
SPREADSHEET $ YEAR: 1992

N INDEX: 0.81301
N INDEX: 0.86133

All rows are summed by component type

Hardware component-type weight per spacecraft is computed here. Quantity becomes 1.

Visibility into component is lost, consequently component column is blank.

Theoretical first unit component-type cost at the suite level.

SUBSYSTEM	COMP TYPE	COMPONENT	ACCNT ID	FUNCT	ACCNT NAME	QTY	WEIGHT	NONREC	REC	T1
ADCS	DIGITAL ELECTRONICS			TOT		1	161	11,676,244	9,348,471	9,348,471
ADCS	RCS			TOT		1	1210.5	12,002,425	9,466,220	9,466,220
ADCS	SENSOR			TOT		1	94.15	1,000,500	4,139,243	4,139,243
AGE	MECH / ELEC			TOT		1	0	8,150,626	0	0
AGE	TESTING			TOT		1	0	11,879,333	0	0
AGE	TOOLING			TOT		1	0	1,535,053	0	0
EPS	GENERATION					1	398	3,343,590	6,189,503	6,189,503
EPS	MPA					1	1228.6	365,403	601,040	601,040
EPS	PCD					1	726.3			16,895,277
IA&T	I & A					1	0			7,889,054
IA&T	SYS TEST					1	0			16,470,676
LOOS	LOOS					1	0			9,573,736
OTHER	OTHER			TOT		1	0	8,345,519	5,227,456	5,227,456
PROG LEVEL	DATA			TOT		1	0	2,695,592	2,458,373	2,458,373
PROG LEVEL	ENGINEERING			TOT		1	0	32,861,353	22,449,810	22,449,810
PROG LEVEL	MANAGEMENT			TOT		1	0	11,066,206	19,608,968	19,608,968
SOFTWARE	SOFTWARE			TOT		1	0	13,719,020	1,335,523	1,335,523
STRUCTURE	OTHER			TOT		1	11629.1	29,980,063	36,729,052	36,729,052
THERMAL	ACTIVE			TOT		1	61.9	915,761	3,714,226	3,714,226
THERMAL	PASSIVE			TOT		1	312.1	8,262,559	493,709	493,709
TT&C	ANTENNA			TOT		1	55.2	1,750,231	3,512,367	3,512,367
TT&C	CADH			TOT		1	397.5	605,944	677,362	677,362
TT&C	RF DIST			TOT		1	2	212,203	111,730	111,730
TOTALS:								**176,611,148**	**176,891,798**	**176,891,798**

Spreadsheet # 9: SUBSYSTEM TOTALS

All rows are summed by subsystem

Subsystem weight in pounds.

SPACEC
CONTRA
SPACECR
LAUNCH VEHICLE: SHUTTLE
DRY SC WEIGHT: XX,XXX LB

CONTRACT AWARD: 1978
FIRST LAUNCH: APRIL 91
RAW DATA $ YEAR: 1989
SPREADSHEET $ YEAR: 1992

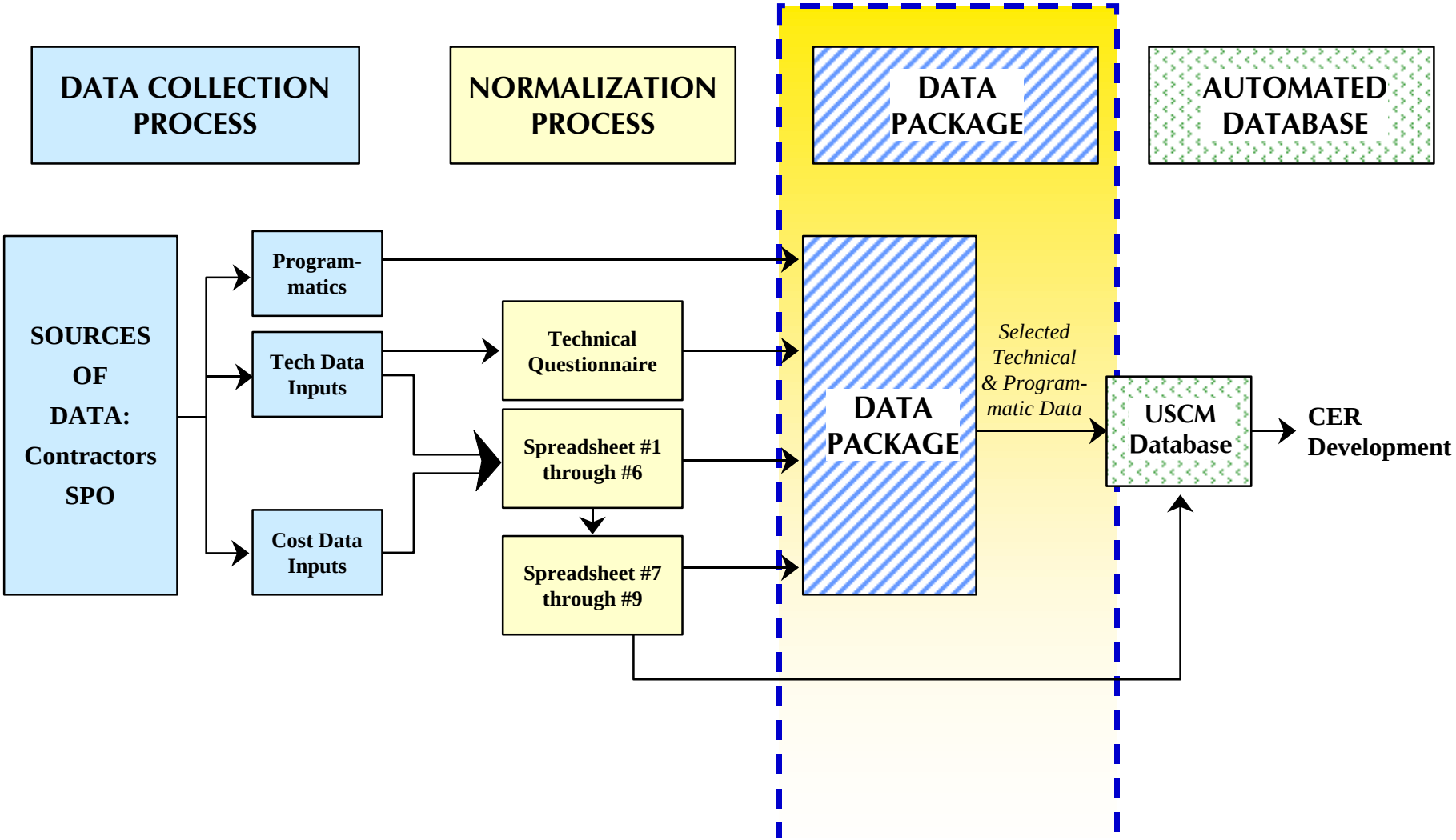
3600 ESCALATION INDEX: 0.81301
3020 ESCALATION INDEX: 0.86133

Component Type and Component columns are blank.

First unit cost based on spacecraft quantity.

SUBSYSTEM	COMP TYPE	COMPONENT	ACCNT ID	FUNCT	ACCNT NAME	QTY	WEIGHT	NONREC	REC	T1
ADCS				TOT		1	1465.65	24,679,168	22,953,934	22,953,934
AGE				TOT		1	0	21,565,012	0	0
EPS				TOT		1	2352.9	14,155,391	23,685,821	23,685,821
IA&T				TOT		1	0	5,797,127	24,359,729	24,359,729
LOOS				TOT		1	0			9,573,736
OTHER				TOT		1	0			5,227,456
PROG LEVEL				TOT		1	0			44,517,152
SOFTWARE				TOT		1	0			1,335,523
STRUCTURE				TOT		1	11629.1			36,729,052
THERMAL				TOT		1	374	9,178,320	4,207,935	4,207,935
TT&C				TOT		1	454.7	2,568,378	4,301,460	4,301,460
TOTALS:								**176,611,148**	**176,891,798**	**176,891,798**

USCM7 Database Development



Data Package Organization

- **Introduction**
  - Program history
  - System overview
  - Scope of data collection
- **Programmatic**
  - Contract structure
  - Subcontractor information
  - Contract modifications
  - Program schedules
- **Technical data**
  - Space vehicle synopsis
  - Functional, physical, and technical descriptions
  - Level of design inheritance
  - Cover all subsystems/components

Data Package Organization (Cont.)

- **Cost methodology**
  - Spreadsheet format
  - WBS mapping
  - Nonrecurring and recurring splits
- **Appendices**
  - Technical questionnaire
  - Mass properties report
  - Inflation indices
  - Normalization spreadsheets
  - Results of additional analysis

Data Package Sample Technical Questionnaire

L-BAND SUBSYSTEM–COMMUNICATION SUBSYSTEM QUESTIONNAIRE

NAME: Diane Kielpinski	DATE: 22-Sep-94
ORGANIZATION: Tecolote Research, Inc.	PHONE #: (310) 536-0011
SPACE VEHICLE: NAVSTAR GPS Block IIR	S/V CONTRACTOR: Martin Marietta Corp.

Instructions

Complete each item by providing the data requested or by indicating the applicable categories with a check in the appropriate space. If more than one item in a particular category is applicable, please provide a percentage mix or explain in the spaces provided for comments.

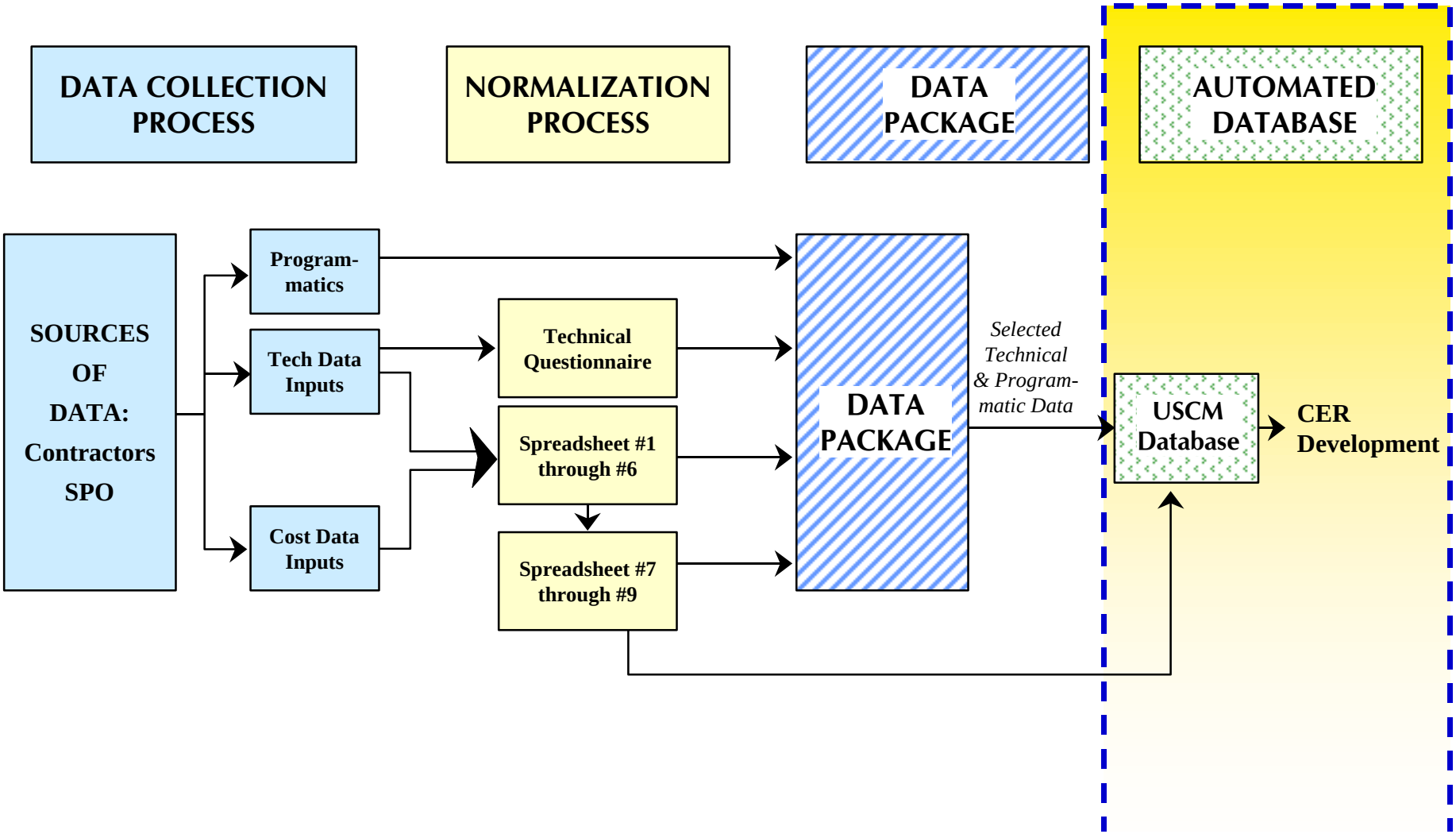
			Reference
1.	Number of Transmit and Receive Channels	3	#19, p. 65
2.	Anti-Jam Capability		
	a. Yes	N/A[1]	#7, p. 4
	b. No		
3.	Encryption Type		
	a. Box Type	✓	#1, FFC-TT&C, p. 789
	b. Embedded Chip		
4.	Gain (Decibels)	See [2]	#7, p. 4
5.	Autonomous Operation (days)	160	#2, p. 18
6.	Crosslink		
	a. Yes		
	b. No	✓	#7

1 The L-Band Subsystem is transmit only.

2

	L1	L2	L3
Gain: G1	14.1	11.5	12.0
Gain: G2-G5	14.7	12.1	12.2

USCM7 Database Development



Automated Database

- **The USCM7 database consists of programmatic, cost, and technical data tabulated by space vehicle for each USCM WBS element**
  - Technical data includes: weights, power levels, frequencies, quantities, component types, etc.
  - Cost data includes: nonrecurring cost, recurring cost, and first unit cost

Automated Database
Sample EPS Generation Data

USCM7 Database–Electrical Power System Generation Components

SPACE VEHICLE	GENERATION COMPONENT	QTY	NONRE C COST	1ST UNIT COST	WEIGHT (LBS)	SOLAR ARR DEPLD (0,1)	SOLAR AREA	# SOLAR CELLS	% SOLAR EFF	SOLAR CELL TYPE	S ARRAY POINTING
DMSP	SAD Electronic	1			6						
GPS	SADPT	1			25.8						
GPSMYP	SADPT	1			33.6						
AE	Solar Array	1			42.3		43	9888		Silicon (8 mils)	None
ATSF	Solar Array	2			68.3					Silicon (8 mils)	
DMSP	Solar Array	1			87.7	1	96	10560		Silicon (8 mils)	None
DSCS-A	Solar Array	4			7.8	1	126		10	Silicon (8 mils)	Single axis
DSCS-B	Solar Array	4			7.9	0	126		10	Silicon (8 mils)	Single axis
FLTSAT	Solar Array	6			8	1	234	22968	12	Silicon (8 mils)	Single axis
GPS	Solar Array	4			7	0	54	5832		Silicon (8 mils)	
GPSMYP	Solar Array	2			14.6	1	78	8424		Silicon (8 mils)	
NATO3	Solar Array	1			104.1	0	160	24774	11	Silicon (8 mils)	
P78	Solar Array	1			33	0	25		14	Silicon (8 mils)	Two axis
TDRSS	Solar Array	6			48.1	1	318	28080	12	Silicon (8 mils)	
TACSAT	Solar Cells	1			112.1	0	319	80000	9	Silicon (8 mils)	
IDCSP	S cells/Glass	1			21.3	0	20	7808		Silicon (8 mils)	Single axis
S3	Solar Panel	6			1.8	0	24	7372	11	Silicon (8 mils)	
I-4	Solar Panels	2			42.5	0	221	45012		Silicon (8 mils)	
MARIST	Solar Panels	1			45.6	0	107	8228	9	Silicon (8 mils)	Single axis
OSO	Solar Power	1			16.7	1	50	9792		Silicon (8 mils)	
DMSP-5D	ADE	1			6.2						
DMSP-5D	Solar Array	1			102.9	1	125	13056	9	Silicon (8 mils)	Single axis

Summary

- Systematic data collection process ensures data is collected and normalized consistently
- The nine-spreadsheet normalization process preserves the details of the data and establishes a clear audit trail from raw to normalized data
- Data packages serve as a program reference manual for multiple uses
- Robust database allows data to be used for multiple purposes other than CER development