

Report No. UMTA-IT-06-0026-76-1

APTA URTV  
DRL STDS  
25/11/86

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• ASDP

# VEHICLE INTEGRATION PLAN

DOT-UT-10007

URBAN RAPID RAIL VEHICLE  
AND SYSTEMS PROGRAM

**Boeing Vertol Company**  
**Surface Transportation Systems**  
**Philadelphia, Pa. 19142**



**ADVANCED SUBSYSTEM  
DEVELOPMENT PROGRAM**

Prepared for

**URBAN MASS TRANSPORTATION ADMINISTRATION**  
**Office of Research and Development**  
**Washington, D.C. 20591**



THE **BOEING** COMPANY

VERTOL DIVISION • PHILADELPHIA, PENNSYLVANIA

CODE IDENT. NO. 77272

NUMBER D239-10007-1

TITLE ADVANCED SUBSYSTEM DEVELOPMENT PROGRAM (ASDP)  
VEHICLE INTEGRATION PLAN

ORIGINAL RELEASE DATE \_\_\_\_\_ . FOR THE RELEASE DATE OF  
SUBSEQUENT REVISIONS, SEE THE REVISION SHEET. FOR LIMITATIONS  
IMPOSED ON THE DISTRIBUTION AND USE OF INFORMATION CONTAINED  
IN THIS DOCUMENT, SEE THE LIMITATIONS SHEET.

MODEL \_\_\_\_\_ CONTRACT DOT-UT-10007

ISSUE NO. \_\_\_\_\_ ISSUED TO: \_\_\_\_\_

PREPARED BY	<u>D. K. Griffin</u>	DATE	<u>12-4-75</u>
APPROVED BY	<u>R. H. Line/W. Ballauer</u>	DATE	<u>12/8/75</u>
APPROVED BY	<u>J. S. Hazley</u>	DATE	<u>12-8-75</u>
APPROVED BY	<u>R. L. Wesson</u>	DATE	<u>12-22-75</u>



1. Report No. UMTA-IT-06-0026-76-1		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle ADVANCED SUBSYSTEM DEVELOPMENT PROGRAM (ASDP) VEHICLE INTEGRATION PLAN				5. Report Date December 1975	
				6. Performing Organization Code	
7. Author(s)				8. Performing Organization Report No. D239-10007-1, Rev. A	
9. Performing Organization Name and Address The Boeing Vertol Company Surface Transportation Systems Department P.O. Box 16858 Philadelphia, Pennsylvania 19142				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. DOT-UT-10007	
12. Sponsoring Agency Name and Address Department of Transportation Urban Mass Transportation Administration 2100 Second Street, S.W. Washington, D.C. 20590				13. Type of Report and Period Covered Vehicle Integration Plan	
				14. Sponsoring Agency Code	
15. Supplementary Notes					
16. Abstract  This document defines requirements and techniques for compatible integration of the ASDP propulsion, truck and brake subsystems into the two SOAC vehicles. Also included is the schedule for accomplishing this integration.					
17. Key Words Advanced Subsystem Development Program (ASDP) State-of-the-Art Car (SOAC) Integration Interface Compatibility				18. Distribution Statement	
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages	22. Price



LIMITATIONS

This document is controlled by STS Engineering, Dept. 2700

All revisions to this document shall be approved by the  
above noted organization prior to release.





**ACTIVE SHEET RECORD**

SHEET NUMBER	REV LTR	ADDED SHEETS				SHEET NUMBER	REV LTR	ADDED SHEETS			
		SHEET NUMBER	REV LTR	SHEET NUMBER	REV LTR			SHEET NUMBER	REV LTR	SHEET NUMBER	REV LTR
i	A					5-1	-				
ii	A					5-2	-				
1-1	A										
2-1	A										
2-2	A										
3-1	A										
4-1	A										
4-2	A										
4-3	A										
4-4	-										
4-5	-										
4-6	A										
4-7	A										
4-8	A										
4-9	-										
4-10	A										
4-11	-										
4-12	A										
4-13	A										
4-14	A										
4-15	A										
4-16	A										
4-17	A										
4-18	A										
4-19	-										
4-20	-										
4-21	A										



**REVISIONS**

LTR	DESCRIPTION		DATE	APPROVAL
	<b>SHT. NO.</b>	<b>PARA.</b>		
A	i	Table of Contents		
			Added: "4.4 Hardware Item List; 4.5 Test Program; 4.5.1 ASDP Subsystem Contractor; and 4.5.2 ASDP Vehicle.	
A	ii	List of Illustrations		
			Added: Figures 4-3, 4-4 and 4-5.	
A	1-1	1.1		
			Change" "...state-of-the-art cars (SOAC ..." to read: " ... State-Of-The-Art Cars (SOAC ...".	
A	1-1	1.2		
			Change: " ... DOT Document D174-10031-1 and will be applied ..." to read: " ... DOT Contract DOT-UT-10007 and will be followed ... "	
			Change: "Task 5 - Procure Propulsion System" to read: "Task 5 - Procure Self Synchronous Propulsion System".	
			Change: "Task 6 - Procure Trucks" to read: Task 6 - Procure Improved Ride Quality Monomotor Truck".	
			Change: "Task 7 - Procure Brake System" to read: Task 7 - Procure Synchronous Brake System".	
			Change "Task 9 - Vehicle Integration Design" to read: "Task 8 - Vehicle Integration".	
			Change: "Task 10 - SOAC Preparation for ASDP" to read: "Task 9 - SOAC Equipment Removal".	
			Change: "Task 11 - Subsystem Installations" to read: "Task 10 - Subsystem Installation".	



**REVISIONS**

LTR	DESCRIPTION		DATE	APPROVAL
	SHT. NO.	PARA.		
				Change: "Task 12 - Quality Assurance" to read: "Task 11 - Quality Assurance"
A	2-1	2.1		Change: "D174-10031-1 Advanced Subsystem Development Program Implementation Plan (SOAC Integration) Contract DOT-UT-1007, dated March 1975, submitted to ..." to read: Report No. UMTA-IT-06-0026-76-2, Program Implementation Plan (SOAC Integration), dated July 1976, prepared for ...".
A	2-1	2.2		Change: "D239-10000-1 Rev. A - Self Synchronous Propulsion System Specification, Boeing Vertol Company" to read: "Report No. UMTA-IT-06-0026-75-1, Self Synchronous Propulsion System Specification, prepared for UMTA by Boeing Vertol Company" (and relocate from Para. 2.2 to Para. 2.1).
				Change: "D239-10001-1 - Improved Ride Quality Monomotor Truck Specification for URRV Advanced Subsystem Development Program, Boeing Vertol Company" to read: "Report No. UMTA-IT-06-0026-75-2, Improved Ride Quality Monomotor Truck Specification, prepared for UMTA by Boeing Vertol Company" (and relocate from Para. 2.2 to Para. 2.1).



## REVISIONS

LTR	DESCRIPTION		DATE	APPROVAL
	SHT. NO.	PARA.		
A	2-2	2.2		
			Change: "D239-10002-1 - Synchronous Hydraulic Brake System Specification for the Advanced Subsystem Development Program, Boeing Vertol Company" to read: Report No. UMTA-IT-06-0026-75-3, Synchronous Brake System Specification, prepared for UMTA by Boeing Vertol Company" (and relocate from Para. 2.2 to Para. 2.1).	
A	3-1	3.1		
			Change: " ... specifications adequately define the installed hardware" to read: " ... specifications define physical and functional characteristics of the delivered hardware. The delivered hardware from each subcontractor ... Boeing and the affected interface contractors".	
A	4-1	4.1.1		
			Change: "A drawing list is a contractual requirement for each of the ASDP subcontractors" to read: "A drawing tree will be provided by each of the ASDP subcontractors".	
A	4-2	4.1.3		
			Add: to the data to be included on each drawing: "o Necessary maintenance and overhaul information for service and repair".	
A	4-3	4.1.4		
			Change: "SK239 ... STS 93L1" to read: "239, is the assigned Boeing Vertol model number. Drawings and functional test documents will be prepared and released by the established formal procedures defined in Boeing Vertol Drafting Standard Manual DSM STS 93L1".	





## REVISIONS

LTR	DESCRIPTION		DATE	APPROVAL
	SHT. NO.	PARA.		
A	4-3	4.1.4(a)		
			Change: "A drawing will be ... modifications and built-up". to read: "Boeing will prepare a final car assembly drawing which incorporates all ASDP ... wiring to be removed".	
A	4-6	4-2		
			Added: "The installation of new ... with other subsystems".	
	4-7			
			Added: "Therefore a review ... environment will be analyzed".	
A	4-8	4.2.2		
			Added: "Figures 4-3 ... minute detail".	
A	4-9	4.2.2		
			Para.(c): Change: "Sheets are ... engineers office". to read: "Sheets are to be originated by the responsible Boeing Vertol engineer. Approval will be made by each of the interfacing contractors and the Boeing Vertol Project Engineer. Changes may be initiated by any approving signer but must be concurred by all approving signers. Log Numbers will be assigned sequentially from log books to be maintained in the Project Engineer's Office. The approved sheets will be kept in the Program Files".	
			- Para.(c): Add: "The interface requirements, related action items, and the associated test plan must be resolved before CDR. The as-approved CDR design shall serve as the baseline for evaluating the as-installed equipment compliance with the ASDP subsystem design specifications: UMTA-IT-06-0026-75-1, UMTA-IT-06-0026-75-2, and UMTA-IT-06-0026-75-3".	
A	4-11	4.3(b)		
			Change: " ... D239-10008-1, prior to ... design specifications". to read: " ... D239-10008-1, and delivered in accordance with the CDRL of the ASDP".	



**REVISIONS**

LTR	DESCRIPTION		DATE	APPROVAL
	SHT. NO.	PARA.		
A	4-11	4.4		
	Add as a new para.: "HARDWARE ITEM LIST - Each ASDP subsystem contractor shall submit a list of all deliverable hardware items being furnished for the subsystem as described by the subsystem contractor's drawing tree (Ref. - Para. 4.1.1). The method of serialization of these hardware items shall be described".			
A	4-13	Fig. 4.2		
	Add to "Existing SOAC" block a new column reading "Electrical Wiring" and make appropriate entries in the rows for "ASDP Propulsion", "ASDP Truck", and ASDP Brake".			
A	4-16	4.5		
	Add as a new Para.: "TEST PROGRAM -  4.5.1 ASDP Subsystem Contractor - The Test Program to be conducted by each ASDP subsystem contractor on his equipment prior to acceptance for installation into the ASDP Vehicle is defined in the applicable ASDP subsystem specification. (See: Section 8 of UMTA-IT-06-0026-75-1, "ASDP Self Synchronous Propulsion System Specification", Section 8 of UMTA-IT-06-0026-75-2, "ASD" Synchronous Brake System Specification", and Section 5 of UMTA-IT-06-0026-75-3, "ASDP Improved Ride Quality Monomotor Truck Specification.  4.5.2 ASDP Vehicle - The ASDP Vehicle Test Program to be conducted by Boeing Vertol at the UMTA Rail Transit Test Track, DOT High Speed Ground Test Center, Pueblo, Colorado is defined in Boeing Vertol document (TBD). The ASDP subsystem contractors will assist as described in the ASDP subsystem design specification UMTA-IT-06-0026-75-1, UMTA-IT-06-0026-2, and UMTA-IT-0026-75-3".			



**REVISIONS**

LTR	DESCRIPTION		DATE	APPROVAL
A	SHT. NO. 4-14	PARA. Fig. 4-1	8-11-76	<i>J. Hagley</i>
A	4-15	Fig. 4-2	8/11/76	<i>E. Luter</i>
A	4-10	4.3(a)		
<p>Drawing tree was updated</p> <p>Added: "Resonating Inductor" and "Electrical Wiring"; "Function (F)" and "Physical (P)" interfaces change accordingly.</p> <p>Change: "D239-10000-1, D239-10001-1, and D239-10002-1" to read: "UMTA-IT-06-0026-75-1, UMTA-IT-06-0026-75-2, and UMTA-IT-06-0026-75-3".</p>				
REV. A	<p>Specification revised to clarify and to incorporate recommended changes from DOT personnel.</p>			
	<p>Accordingly, sheet numbering changed as follows:</p>			
	4-9	was 4-8		
	4-10	was 4-9		
	4-12	was 4-10		
	4-13	was 4-11		
	4-14	was 4-12		
	4-15	was 4-13		
	4-19	was 4-14		
	4-20	was 4-15		
	4-21	was 4-16		
	<p>Added the following sheets.</p>			
	4-16			
	4-17			
	4-18			



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## 1.0 SCOPE

### 1.1 Definition

This document defines the documentation and techniques to be utilized to insure compatibility in the incorporation of the following advanced subsystems into the two State-Of-The-Art Cars (SOAC):

- o Self-Synchronous Propulsion System
- o Improved Ride Quality Monomotor Trucks
- o Synchronous Brake System

### 1.2 Applicability

This document fulfills the requirements of Task 2 - Integration Plan of DOT Contract DOT-UT-10007 and will be followed during accomplishment of the following:

- Task 5 - Procure Self-Synchronous Propulsion System
- Task 6 - Procure Improved Ride Quality Monomotor Truck
- Task 7 - Procure Synchronous Brake System
- Task 8 - Vehicle Integration
- Task 9 - SOAC Equipment Removal
- Task 10 - Subsystem Installation
- Task 11 - Quality Assurance



## 2.0 APPLICABLE DOCUMENTS

### 2.1 Government Documents

Report No. UMTA-IT-06-0026-76-2, Program Implementation Plan (SOAC Integration), dated July 1976, prepared for UMTA by Boeing Vertol Company.

Report No. IT-06-0026-73-2, Detail Specification for State-of-the-Art Car, dated May 1973, prepared for UMTA by Boeing Vertol Company.

Report No. UMTA-IT-06-0026-75-1, Self Synchronous Propulsion System Specification, prepared for UMTA by Boeing Vertol Company.

Report No. UMTA-IT-06-0026-75-2, Improved Ride Quality Monomotor Truck Specification, prepared for UMTA by Boeing Vertol Company.

Report No. UMTA-IT-06-0026-75-3, Synchronous Brake System Specification, prepared for UMTA by Boeing Vertol Company.

### 2.2 Non-Government Documents

DSM-STS-93L1 - Drafting Standards Manual - Surface Transportation Systems, Boeing Vertol Company.

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D239-10008-1 - Advanced Subsystem Development Program Vehicle  
Design Specification (Modified State-of-the-Art Car), Boeing  
Vertol Company (unissued).





### 3.0 REQUIREMENTS

#### 3.1 Configuration Control

Systems and procedures shall be applied by Boeing Vertol and by each ASDP subsystem contractor to insure that drawings and specifications define physical and functional characteristics of the delivered hardware. The delivered hardware from each subcontractor shall be identified by the latest design revision and the drawings delivered will reflect these revisions. Subsequent changes in the hardware will be accomplished by using engineering change orders and remarking the parts. Copies of all engineering changes will be forwarded to Boeing and the affected interface subcontractors.

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Upon completion of the vehicle systems acceptance tests at TTC, Pueblo, complete drawing packages will be delivered to Boeing Vertol reflecting the "as modified" configuration of each subsystem.

#### 3.2 Compatibility

Vehicle and subsystem physical and functional interfaces shall be identified and analyzed. Detailed interface requirements shall be communicated to the design activities and drawings and specifications shall be monitored by Boeing Vertol to assure compatibility.



## 4.0 PROCEDURES

This section defines specific documentation and procedures to be utilized to assure system and vehicle compatibility.

### 4.1 Configuration Control

#### 4.1.1 Drawing Tree

The vehicle drawing tree included herein as Figure 4-1 illustrates the integration design and accounts for all the drawings which will define the total vehicle assembly. All Boeing Vertol drawings to the detail level and ASDP subsystem (subcontractor) drawings to the installation assembly package level are shown.

A drawing tree will be provided by each of the ASDP subsystem subcontractors.

#### 4.1.2 System Schematic Diagrams

Subsystem schematic diagrams will be furnished by each of the ASDP subcontractors, illustrating functional relationships and interfaces within each system and with other vehicle subsystems, and depicting equipment packages.

The following vehicle system schematic drawings shall be

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prepared by Boeing Vertol:

- o Propulsion/Brake/Electrical - block diagram to include the same information as the subcontractor's subsystem schematic plus additional illustration of functional relationships within and between interfacing vehicle subsystems.
- o Pneumatic/Brake - to include the same information as the brake subcontractor's schematic plus the compressor (including control), piping and valving, coupler interfaces, truck airspring/load leveling and interfaces with the propulsion subsystem.

#### 4.1.3 Subsystem Component/Assembly Drawings

The ASDP subcontractors will furnish a drawing for each component or assembly to be installed on the vehicle. Each drawing shall include at least the following:

- o Mounting interface dimensions including tolerances.
- o Other physical, fluid and electrical connection dimensional and definition data.
- o Envelope, including servicing/parts removal dimensions.
- o Weight
- o Special installation precautions.
- o Maintenance and overhaul information for service and repair to supplement the maintenance instructions.

#### 4.1.4 Integration Drawings

Drawings shall be prepared to define the installation/assembly build-up of the vehicle as shown on the Figure 4-1 drawing tree. Drawing numbers include a common prefix,



"239", is the assigned Boeing Vertol model number. Drawings and functional test documents will be prepared and released by the established formal procedures defined in the Boeing Vertol Drafting Standards Manual DSM STS 93L1.

- (a) Boeing will prepare a final car assembly drawing which incorporates all ASDP installations including the SOAC Equipment Removal Drawing as shown on the drawing tree. The Equipment Removal drawing will catalog the equipment removed by St. Louis Car Company drawing number and title; a subassembly Wiring Removal drawing will define the St. Louis Car Company wiring to be removed.
- (b) Structural modifications to accommodate the ASDP truck and internal cab modifications to accommodate the ASDP monitor panel and handbrake control will be covered by separate drawings. Provisions have been made for two drawings to cover fabricated mounting brackets which may be required for equipment installations.
- (c) Each ASDP component installation will be covered by a separate installation drawing except where components located in one area may be conveniently grouped for installation purposes or where one drawing can define identical installations, in two (or more) locations. These drawings will specify

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mounting hardware, including prefabricated brackets of (b) above; holes in car structure; and simple bracket details. The drawings will also define connections other than mounting and any required hardware.

- (d) The cab equipment installation and undercar equipment installation drawings will serve to list and to illustrate the relative positioning of the individual installations. In addition, these drawings will specify the fluid line and electrical conduit installations, including tubing, connectors, clamps, etc. A fluid line schematic will be prepared, based on the SOAC drawing 2D35043, for reference use and to illustrate the integration of the SOAC pneumatic system with the ASDP brake and suspension systems.
- (e) For the ASDP truck, frame and axle assembly drawings plus a pipe and cable installation drawing will define the build-up of the truck (less roll bar) into a discrete assembly. The roll bar will be treated as a separate assembly and installed as part of the truck installation.
- (f) Electric wiring will be defined by wiring diagrams for ASDP subsystems to show interface connections, plus cabling drawings and installation drawings. For



reference purposes a book type drawing containing electrical schematics will be prepared. Individual wires with terminations and approximate lengths will be specified on the cabling drawings in tabular form. Since only two cars are involved, the wiring installations will be accomplished on a mockup basis with a minimum of formal drawing definition, largely "after-the-fact", to provide a record for reference during the test and demonstration operations.

#### 4.1.5 Modifications

Change control is specified in the ASDP subcontracts and shall be imposed within Boeing Vertol to assure configuration accountability. The approach will be to define the baseline designs, then monitor and communicate changes on a timely basis between subcontractors and Boeing Vertol.

- (a) For each of the three ASDP system subcontractors, the design baseline shall be as defined by the proposal and specified in the formal contract. Component drawings and specifications, as they are developed, will be monitored by Boeing Vertol for compliance with the baseline definition and recording of deviations. Monitoring will be continued throughout the program to insure that the change



control to be exercised by each subcontractor results in full documentation of modifications and precise definition of installed hardware.

- (b) For the Boeing Vertol integration design, a preliminary baseline definition will be provided in the engineering work statement. This will be supplemented by integrated schematic drawings and the vehicle specification, as they are released. The release and distribution of these documents and any revisions will be controlled and recorded in accordance with the procedures of DSM STS 93L1. The installation and assembly drawings of 4.1.4 above will complete the integration design equipment definition and will be controlled, including revisions, by the DSM STS 93L1 procedures.

#### 4.2 Interface Control

The installation of new subsystems into an existing rail vehicle must be done with a great deal of forethought. Even though these subsystems may perform to their specifications in the laboratory, they may not perform as intended when mated with the vehicle and or with other subsystems.

This section defines the means to be used to assure compatibility between and among the ASDP and other vehicle subsystem, which is vital to successful performance of the vehicle. The approach is to identify all of the interfaces involved, establish the degree

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of compatibility analysis required in each case and define means to communicate requirements and assure compliance. Therefore, a review of each interface must be performed to assure subsystem compatibility. In addition, overall system analyses must be made. The following systems analyses are planned:

- (a) A structural analysis of those areas affected by the ASDP change will be performed that will assure vehicle structural integrity.
- (b) Dynamic and ride quality analysis will be performed.
- (c) An electrical loads analysis and electromagnetic compatibility test will provide safeguards against electrical incompatibilities.
- (d) Vehicle and subsystem effects on the environment will be analyzed.

#### 4.2.1 Interface Identification

ASDP subsystem/SOAC subsystem interfaces are shown in the matrix chart, Figure 4-2. This chart identifies interfaces between and among ASDP subsystems and other vehicles subsystems and also within each ASDP subsystem down to the "installation package" level; the internal interfaces are the responsibility of the subsystem contractor but are identified here to assist in monitoring subsystem design. The chart symbols "P" (= physical) and "F" (= functional) serve to distinguish those interfaces which are only physical





(mounting, mechanical drive, etc.) from those which are fluid or electrical, where the physical connections may be secondary and even indirect although they must be controlled for compatibility. While all must be resolved, the latter items generally will be given first priority to permit subsystem design to proceed.

Further definition of each of the subsystem interfaces will be accomplished as discussed below.

#### 4.2.2 Compatibility Analysis

Figures 4-3, 4-4, and 4-5 show an overview of the ASDP/SOAC Electrical Power Interfaces, the ASDP/SOAC Electrical Signal Interfaces, and the ASDP/SOAC Mechanical Interfaces respectively. "ASDP SOAC Integration Analysis" sheets define each interface item in minute detail:

- (a) All interfaces require analysis to insure compatibility but the extent of analysis required varies significantly. The initial step in the analysis is to define the information required and to designate subcontractor and Boeing Vertol

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responsibilities for furnishing the information. This step will be accomplished prior to the Preliminary Design Review for each ASDP subsystem. Each interface is to be summarized on an "ASDP SOAC Integration Analysis" sheet utilizing the form shown in Figure 4-3. Copies of these analysis sheets are to be furnished to the affected subcontractors (and to the involved Boeing Vertol activities) for concurrence and for action.

- (b) In certain cases, resolution of interfaces requires little more than unilateral furnishing of information. In other cases, considerable dialogue between the affected activities plus design layout and analysis will be required. To facilitate this process, integration meetings are scheduled early in the program and Boeing Vertol, as systems manager, will coordinate exchanges between subcontractors to expedite resolution of interfaces.
- (c) The "ASDP-SOAC Integration Analysis" forms are to be used not only to record interface coordination but also to record resolution of action items resulting from design reviews. The log number



for each sheet will include a designator prefix, as follows:

I-XXX        Interface Resolution

A-XXX        Action Item Resolution

Sheets are to be originated by the responsible Boeing Vertol engineer. Approval will be made by each of the interfacing contractors and the Boeing Vertol Project Engineer. Changes may be initiated by any approving signer but must be concurred by all approving signers. Log Numbers will be assigned sequentially from log books to be maintained in the Project Engineer's Office. The approved sheets will be kept in the Program Files.

The interface requirements, related action items, and the associated test plan must be resolved before CDR. The as - approved CDR design shall serve as the baseline for evaluating the as-installed equipment compliance with the ASDP subsystem design specifications: UMTA-IT-06-0026-75-1, UMTA-IT-06-0026-75-2, and UMTA-IT-06-0026-75-3.

#### 4.2.3 Specification of Requirements

The resolution of each interface will be reflected on component, assembly or installation drawings. Physical data shall be called out directly or by referring to an approved standard while functional characteristics and other interface requirements shall be included in specifications called out on the drawings.



Prior to release of these formal documents, interface specifications will be documented informally in sketches, memoranda, etc. Such documentation shall reference the interface log number and identify the document origin and data.





#### 4.2.4 Compliance

Boeing Vertol shall monitor drawings and specifications for incorporation of the interface requirements and will close out each item with notations on the analysis sheet as to where the requirements are formally incorporated. Component compliance with interface requirements will be assured using normal quality assurance monitoring of fabrication and testing.

#### 4.3 Design Specifications

- (a) The existing design specifications for the ASDP subsystems UMTA-IT-06-0026-75-1, UMTA-IT-06-0026-75-2, and UMTA-IT-06-0026-75-3, established performance and compatibility requirements against which the proposed configurations were designed. These specifications will continue to be utilized as the basic requirements documents during the design and development of the subsystems. Changes in the specifications to clarify requirements and to maintain currency as design progresses will be subject to the standard procedures of DSM STS 93L1.
- (b) A vehicle design specification is to be prepared based on the existing SOAC design specification and the above subsystem design specifications. This



specification will be completed, under document number D239-10008-1, and delivered in accordance with the CDRL of the ASDP.

- (c) In order to assure that the impacts of specification changes are reviewed, change requests will be documented utilizing the "Request for Specification Clarification/Change" form of Figure 4-4. Use of this form to coordinate and analyze changes will provide a summary of subcontractor and Boeing Vertol considerations related to each proposed change.

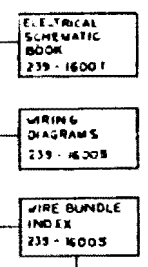
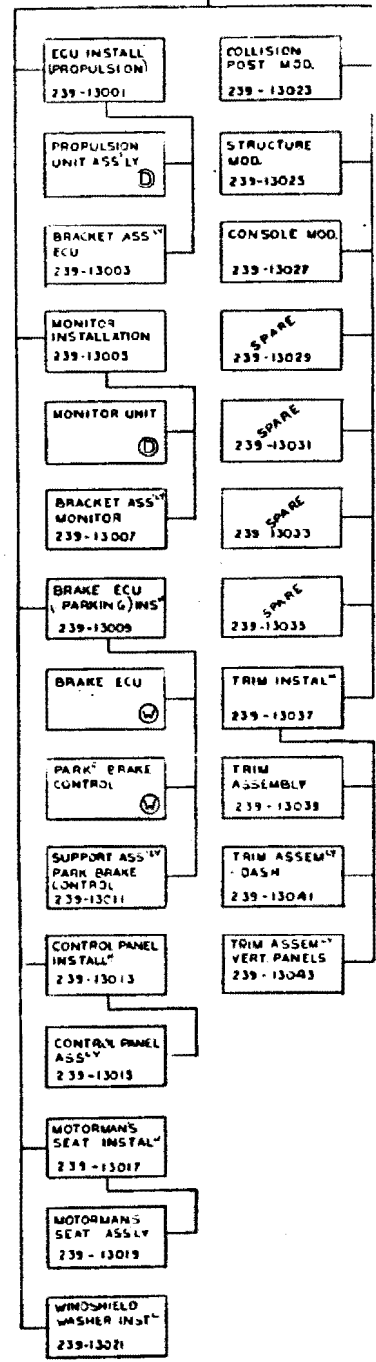
#### 4.4 Hardware Item List

Each ASDP subsystem contractor shall submit a list of all deliverable hardware items being furnished for the subsystem as described by the subsystem contractor's drawing tree (Ref. - Para. 4.1.1). The method of serialization of these hardware items shall be described.



CAB EQUIPMENT INSTALLATION  
 239-13000

ELECTRICAL INSTALLATION  
 239-16000



ES  
 PROCURED UNDER THE FOLLOWING  
 CONDITIONS.  
 19-10000 SELF SYNCHRONOUS PROPULSION SYSTEM.  
 19-10001 IMPROVED RIDE QUALITY MONOMOTOR TRUCK.  
 19-10002 SYNCHRONOUS BRAKE SYSTEM.  
 CONTRACTOR DRAWINGS ARE IDENTIFIED THUS:  
 (B) BUDD, (D) DELCO, (W) WABCO.

SHEET 1 OF 1 PARTS LIST AND NOTES		CONTRACT NUMBER		<b>BRIND VERTEL COMPANY</b> <small>INCORPORATED IN PENNSYLVANIA</small> PHILADELPHIA, PENNSYLVANIA 19102	
DATE	REVISION	DATE	REVISION	<b>ASDP</b> <b>DRAWING TREE</b>	
BY	BY	DATE	DATE		
PRICE	PRICE	DATE	DATE	SIZE CODE SHEET NO <b>J 77272</b>	
DATE	DATE	DATE	DATE		
ISSUED NUMBER	ISSUED NUMBER	DATE	DATE	SCALE 1 OF 1	



SOAC/ASDP SUBSYSTEMS		ASDP SUBSYSTEMS		UNDERFRAME OTHER CAR BODY COUPLERS DOORS AIR COMFORT LIGHTING AUXILIARY ELECTRIC		PROPULSION		TRUCK		BRAKE		PNEUMATICS COMMUNICATIONS ATO/ATC ELECTRICAL WIRING WAYSIDE	
						INPUT FILTER SWITCHGEAR ASSY. POWER CONV. ASSY. COOLER ASSEMBLY BRAKE RESISTOR TRUCK CONN. BOX PROPULSION ECU PROP. MONITOR TRUCK MOTOR ASSY. GROUND ASSEMBLY CPLG./G.B. ASSY. SPEED SENSOR	FRAME/SUSP. ASSY. AXLE WHEEL ASSEMBLY J. BRG. ASSEMBLY TRACK TRIP POWER COLLECTOR ROLL BAR ASSEMBLY	BRAKE UNIT/P.B. BRAKE UNIT/B. P. BRAKE RES. ASSY. MISC. BRK. - "A" END MISC. BRK. - "B" END AIR DRYER CALIPER ASSEMBLY BRAKE DUMP VALVE DISC ASSEMBLY HDBRK. UNIT ASSY. HDBRK. LOGIC ASSY. BRAKE MONITOR BRAKE ECU RESONATING INDUCTOR	PROPULSION SWITCHGEAR ASSY. POWER CONV. ASSY. COOLER ASSEMBLY BRAKE RESISTOR TRUCK CONN. BOX PROPULSION ECU PROP. MONITOR TRUCK MOTOR ASSY. GROUND ASSEMBLY CPLG./G.B. ASSY. SPEED SENSOR	FRAME/SUSP. ASSY. AXLE WHEEL ASSEMBLY J. BRG. ASSEMBLY TRACK TRIP POWER COLLECTOR ROLL BAR ASSEMBLY	BRAKE UNIT/P.B. BRAKE UNIT/B. P. BRAKE RES. ASSY. MISC. BRK. - "A" END MISC. BRK. - "B" END AIR DRYER CALIPER ASSEMBLY BRAKE DUMP VALVE DISC ASSEMBLY HDBRK. UNIT ASSY. HDBRK. LOGIC ASSY. BRAKE MONITOR BRAKE ECU RESONATING INDUCTOR		
PROPULSION	INPUT FILTER	P											
	SWITCHGEAR ASSEMBLY	P											
	POWER CONV. ASSY.	P											
	COOLER ASSEMBLY	P											
	BRAKE RESISTOR	P											
	TRUCK CONN. BOX	P											
	PROPULSION ECU		P										
	PROPULSION MONITOR												
	TRUCK MOTOR ASSY.												
	GROUND ASSEMBLY												
CPLG./G.B. ASSY.													
SPEED SENSOR													
RESONATING INDUCTOR	P												
TRUCK	FRAME/SUSP. ASSY.	P											
	AXLE												
	WHEEL ASSEMBLY												
	J. BRG. ASSEMBLY												
	TRACK TRIP												
	POWER COLLECTION												
ROLL BAR ASSEMBLY	P												
BRAKES	BRK UNIT/P.B.	P											
	BRK UNIT/B.P.	P											
	BRK. RES. ASSEMBLY	P											
	MISC. BRK. - "A" END	P											
	MISC. BRK. - "B" END	P											
	AIR DRYER	P											
	CALIPER ASSEMBLY												
	BRK. DUMP VALVE												
	DISC ASSEMBLY												
	HDBRK. UNIT ASSY.	P											
	HDBRK LOGIC ASSY.	P											
	BRK. MONITOR	P											
BRAKE ECU	P												

FIGURE 4-2 ASDP/SOAC INTERFACE MATRIX





ASDP/SOAC ELECTRICAL POWER INTERFACES

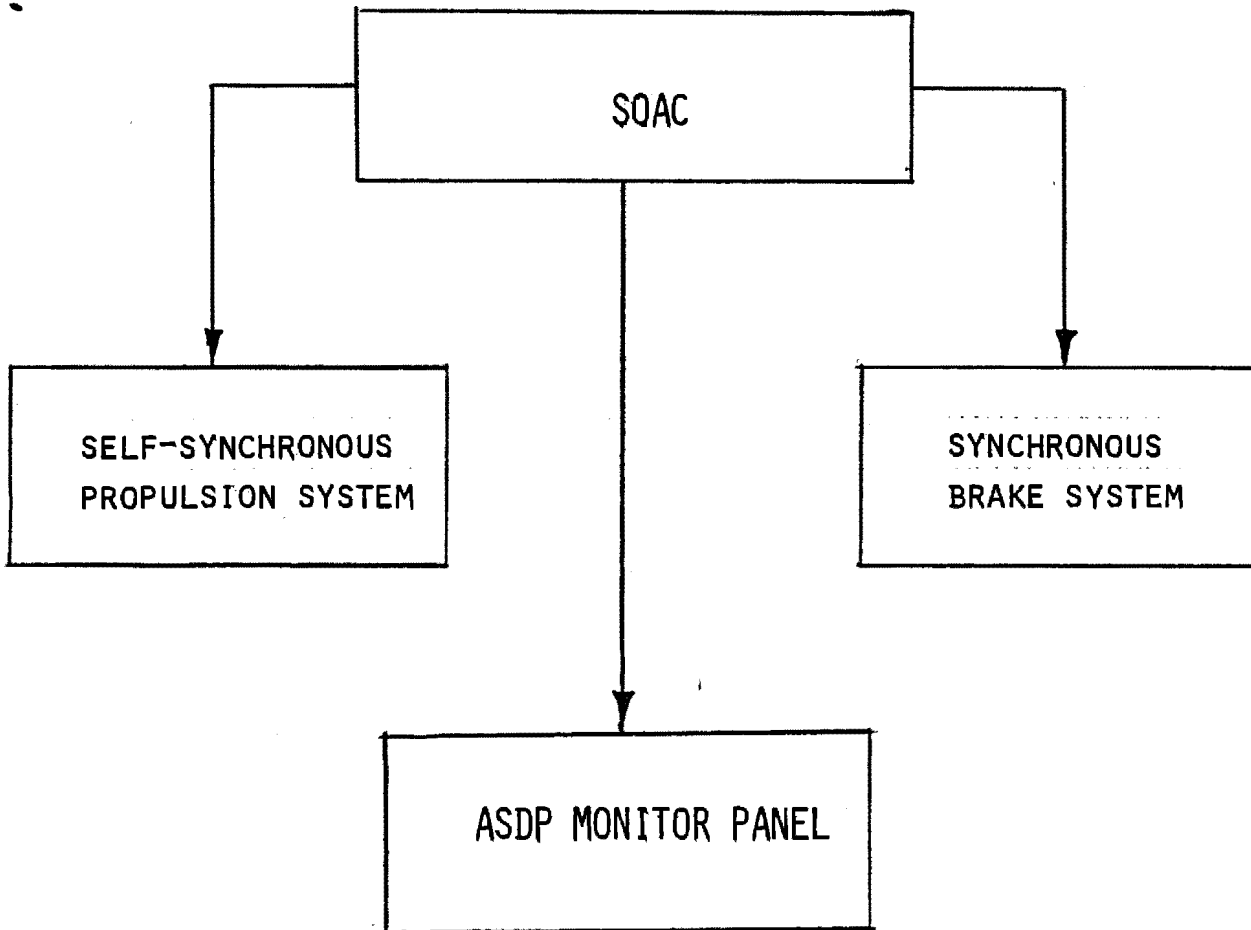


Figure 4-3



ASDP/SOAC ELECTRICAL SIGNAL INTERFACES

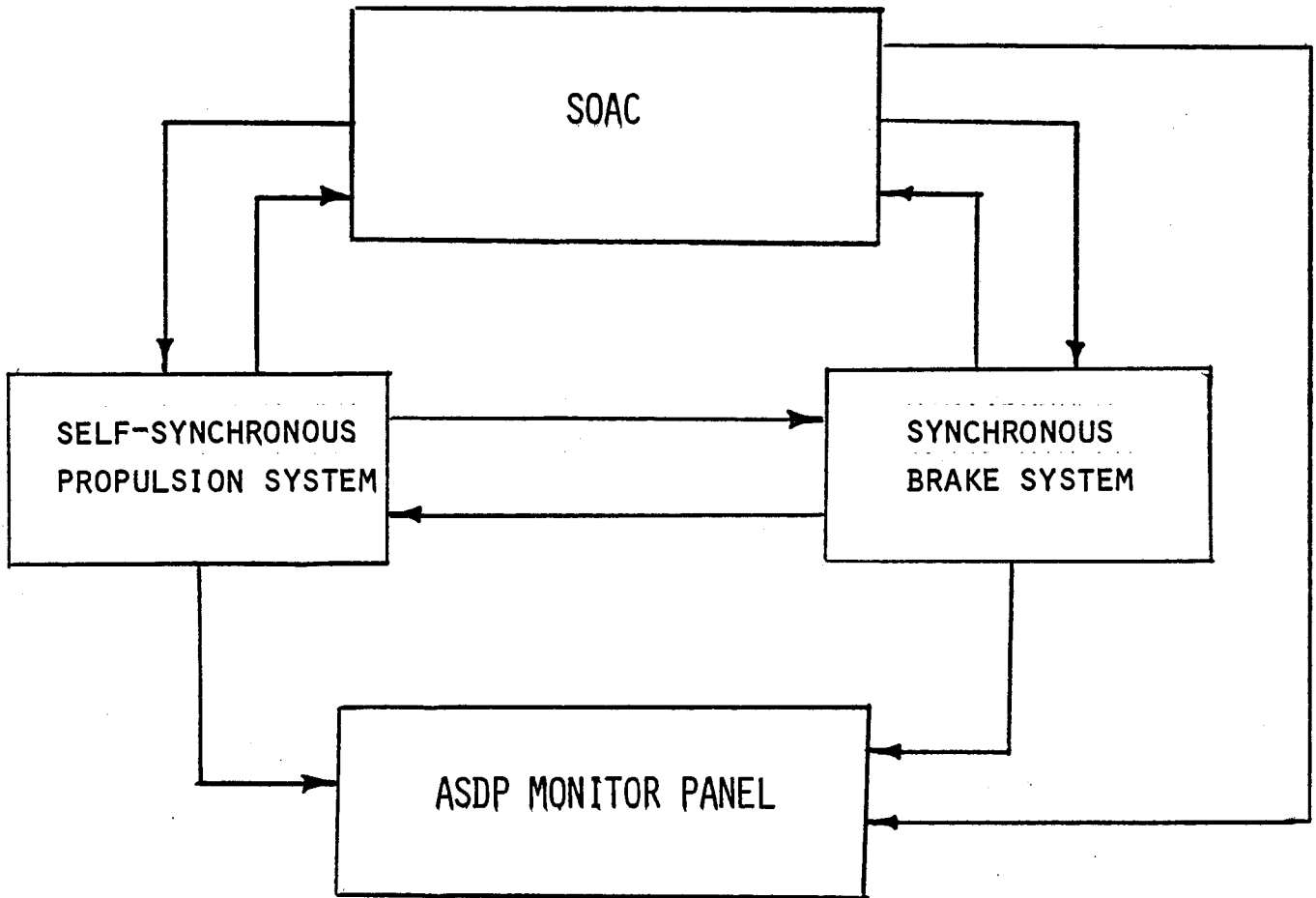
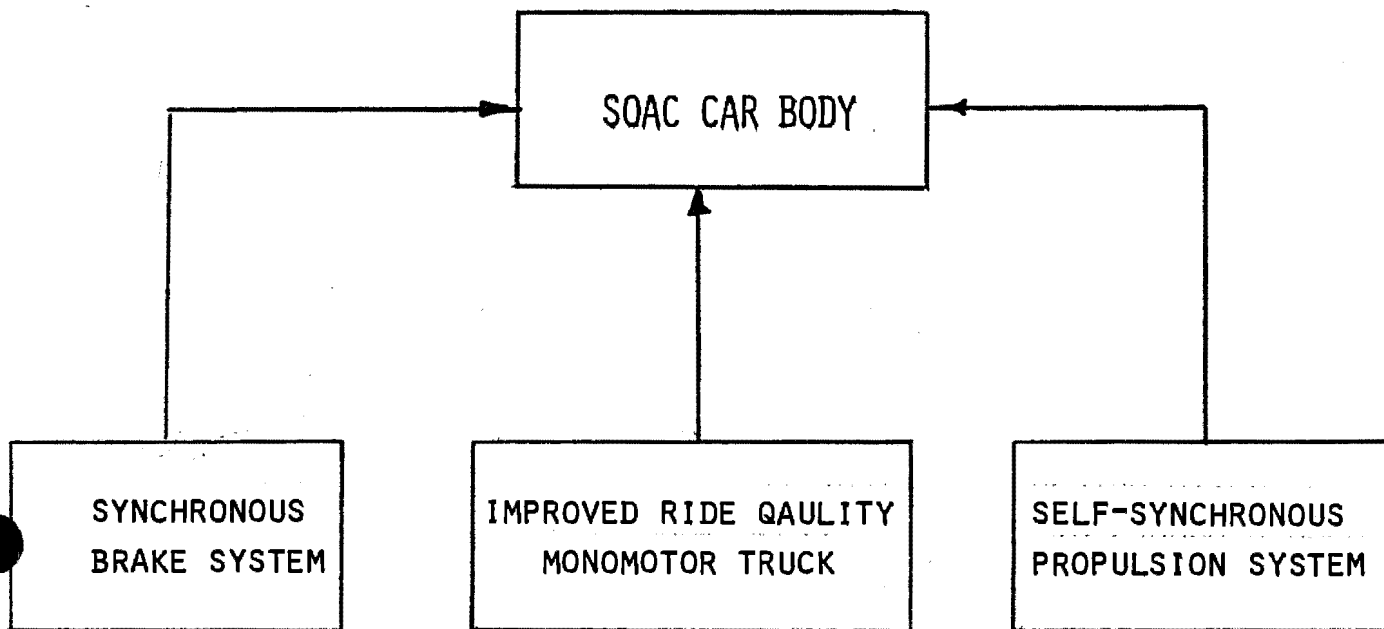


Figure 4-4



ASDP/SOAC MECHANICAL INTERFACES



(NOTE: Mechanical Interfaces include Structural, Pneumatic, and Hydraulic items.)

Figure 4-5



ASDP-SOAC INTEGRATION ANALYSIS

(Interface - - - - - Action Item)

SUBSYSTEMS INVOLVED: \_\_\_\_\_

DESCRIPTION: \_\_\_\_\_

SPEC. REF. \_\_\_\_\_ RESPONSIBLE ENGR. \_\_\_\_\_

Information Required, Action Required and Resolution	Required From and Schedule

STATUS:





REQUEST FOR SPECIFICATION CLARIFICATION/CHANGE  
ASDP PROGRAM

SCCR NO.

<p>1. INITIATION -</p> <p>SOURCE - UMTA( ) BV( ) CONTRACTOR( )</p> <p>REFERENCE -</p> <p>DATE -</p>	<p>2. CATEGORY -</p> <p>SPEC CHANGE ( )</p> <p>CLARIFICATION ( )</p>	<p>3. DISPOSITION -</p> <p>REJECTED ( )</p> <p>WITHDRAWN ( )</p> <p>APPROVED ( )</p>																																			
<p>4. SPECIFICATION REFERENCE(S) AND LINE NUMBER(S) -</p> <p>PARAGRAPH(S) _____</p> <p>LINE NUMBER(S) _____</p>																																					
<p>5. SPECIFICATION NOW READS -</p>																																					
<p>6. INTERPRET/CHANGE SPECIFICATION TO READ -</p>																																					
<p>7. REASON FOR CLARIFICATION/CHANGE -</p>																																					
<p>8. EFFECT ON -</p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:35%;"></th> <th style="width:15%; text-align: center;"><u>NONE</u></th> <th style="width:15%; text-align: center;"><u>INCREASE</u></th> <th style="width:15%; text-align: center;"><u>DECREASE</u></th> <th style="width:20%; text-align: center;"><u>FOR SPECIFICS SEE ATTACHMENT</u></th> </tr> </thead> <tbody> <tr> <td>a. PRICE</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>b. DELIVERY</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>c. PERFORMANCE</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>d. WEIGHT</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>e. OPERATIONAL CAPABILITY</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>f. OTHER _____ Specify</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>				<u>NONE</u>	<u>INCREASE</u>	<u>DECREASE</u>	<u>FOR SPECIFICS SEE ATTACHMENT</u>	a. PRICE	_____	_____	_____	_____	b. DELIVERY	_____	_____	_____	_____	c. PERFORMANCE	_____	_____	_____	_____	d. WEIGHT	_____	_____	_____	_____	e. OPERATIONAL CAPABILITY	_____	_____	_____	_____	f. OTHER _____ Specify	_____	_____	_____	_____
	<u>NONE</u>	<u>INCREASE</u>	<u>DECREASE</u>	<u>FOR SPECIFICS SEE ATTACHMENT</u>																																	
a. PRICE	_____	_____	_____	_____																																	
b. DELIVERY	_____	_____	_____	_____																																	
c. PERFORMANCE	_____	_____	_____	_____																																	
d. WEIGHT	_____	_____	_____	_____																																	
e. OPERATIONAL CAPABILITY	_____	_____	_____	_____																																	
f. OTHER _____ Specify	_____	_____	_____	_____																																	
<p>9. APPROVALS -</p> <ul style="list-style-type: none"> <li>o BOEING VERTOL _____</li> <li>o GM-DELCO _____</li> <li>o BUDD _____</li> <li>o UMTA _____</li> </ul>																																					

Figure 4-7 SPECIFICATION CLARIFICATION/CHANGE  
REQUEST FORM



#### 4.5 Test Program

##### 4.5.1 ASDP Subsystem Contractor

The Test Program to be conducted by each ASDP subsystem contractor on his equipment prior to acceptance for installation into the ASDP Vehicle is defined in the applicable ASDP subsystem specification.

(See: Section 8 of UMTA-IT-06-0026-75-1, "ASDP Self Synchronous Propulsion System Specification", Section 3.5 of UMTA-IT-06-0026-75-3, "ASDP Improved Ride Quality Monomotor Truck Specification", and Section 5 of UMTA-IT-06-0026-75-2, "ASDP Synchronous Brake System Specification".)

##### 4.5.2 ASDP Vehicle

The ASDP Vehicle Test Program to be conducted by Boeing Vertol at the UMTA Rail Transit Test Track, DOT High Speed Ground Test Center, Pueblo, Colorado is defined in Boeing Vertol document (TBD). The ASDP subsystem contractors will assist as described in the ASDP subsystem design specifications UMTA-IT-06-0026-75-1, UMTA-IT-06-0026-75-2, and UMTA-IT-06-0026-75-3 respectively.



## 5.0 SCHEDULE

ASDP integration will be accomplished to the schedule of Figure 5-1. This schedule shows subsystem procurement schedules based on the latest subcontractor proposals and current estimated go-aheads. The integration design schedule is based on limiting the early effort to layouts, schematics, specification updates and analyses so that interfaces will be resolved in conjunction with completion of the subcontractors major design efforts by the time of the Critical Design Reviews.

Detail assembly and installation drawings will be started just prior to the CDR's since enough firm subsystem component drawings should be available and additional drawings follow to maintain the flow.



MONTHS AFTER GO AHEAD	1975				1977							
	OCT	NOV	DEC	JAN	FEB	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	1	2	3	4		21	22	23	24	25	26	27

**MAJOR MILESTONES**

**PROPULSION SYSTEM**

- TRACTION MOTOR
- MOTOR/GEAR BOX COUPLING
- GEAR DRIVE
- SYSTEM TEST
- PWR CONTROL EQUIP  
ELEC. CONTROL EQUIP  
COOLING SYSTEM  
DYN. BRAKE RESISTOR
- PWR CIL SWITCH GEAR  
INPUT FILTER  
GND BRUSH ASSY  
SPEED SENSOR  
TRUCK CONNECTOR BOX  
DIAGNOSTIC EQUIP
- SYSTEM ENGINEERING
- PRODUCT ASSURANCE

**TRUCK SYSTEM**

**BOEING EFFORT**

**BRAKE SYSTEM**

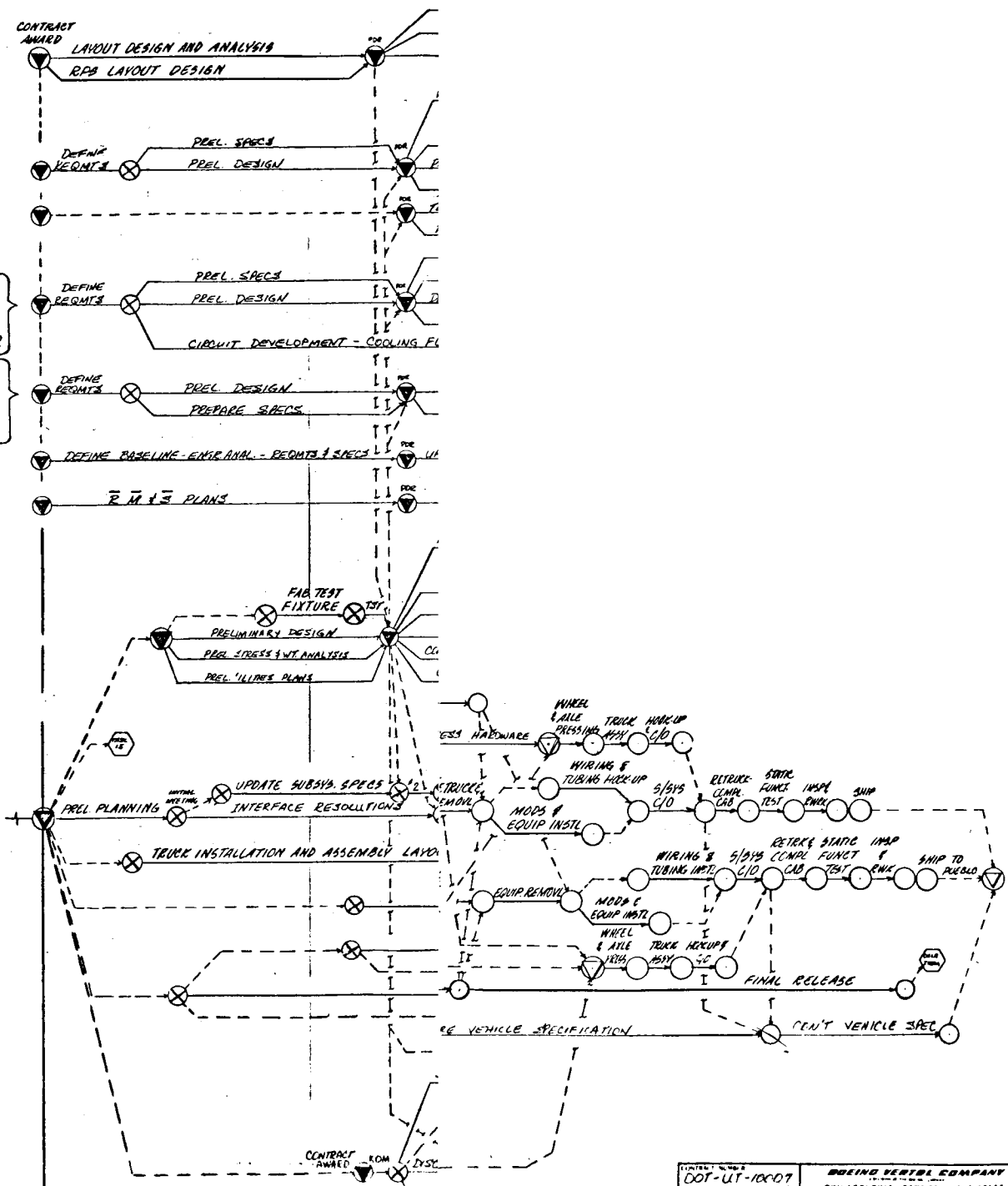


FIGURE 5-1 ASDP/SOAC INTE PAGE 5-2

INTENT NUMBER	DOT-UT-10007	BOEING VERTEC COMPANY
OWN	11-11-75 JMT	PHILADELPHIA, PENNSYLVANIA 19108
CON		ADVANCED SUBSYSTEM
ENG		DEVELOPMENT PROGRAM
PROJECT APPROVAL		PART 1 - SCHE INTEGRATION
REVISED 7-9-76		7777

