

GRUBMAN/PICCARD FX-15 CONTRACT

9 June 1966

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THIS AGREEMENT, effective as of the first day of June, 1966, by and between GRUMMAN AIRCRAFT ENGINEERING CORPORATION, a New York corporation, having its principal place of business at Bethpage, New York (hereinafter referred to as "Grumman"), and JACQUES PICCARD, an individual, residing at 9 Chemin de Fontanettaz, 1012 Lausanne, Switzerland (hereinafter referred to as "Piccard"),

W I T N E S S E T H :

WHEREAS, Grumman and Piccard entered into an Agreement effective as of the first day of February, 1966; and

WHEREAS, Article 4 of said Agreement provides for a study of the proposed PX-15 vehicle and for making certain determinations; and

WHEREAS, the said Article 4 also provides that if a vehicle is to be constructed the parties shall enter into negotiations for a construction contract for such vehicle; and

WHEREAS, said Article 4 also provides for a design fee in the amount of \$150,000 and that title to the design and the materials and components allocated to the construction of the PX-15 shall be vested in Grumman; and

WHEREAS, it has been determined to proceed with construction of a modified PX-15 vehicle;

NOW, THEREFORE, in consideration of the premises and of the mutual promises herein contained, the parties do hereby agree as follows:

2. DESCRIPTION OF THE MODIFIED PX-15 VEHICLE

The modified PX-15 is an underwater work vehicle with a collapse depth of 4000 feet and a capability for long periods of submerged operation. It can carry up to 10 men and all types of scientific and experimental payloads. This submarine vehicle has provisions for convertability. Interchangeable sections will allow various scientific experiments, diver systems, and other alternative configurations to utilize the basic propulsion and control part of the vehicle.

The vehicle will meet American Bureau of Shipping certification requirements.

A complete description of the vehicle is contained in Appendix C, entitled "PX-15 General Specification", attached hereto and made a part hereof.

3. PICCARD/GRUMMAN TASK DIVISION

Piccard will be responsible for systems management during construction and initial trials including design and insuring construction of good workmanship and material. Grumman's responsibilities will be in the areas of overall supervision responsibility for the complete PX-15 and in the areas of hull structural verification, life support mission profile and objectives and miscellaneous technical advice as requested. Grumman's tasks are more fully set forth in Paragraph 4 below, and Piccard's tasks are more fully set forth in Paragraph 5 below. More specifically, however, the tabulation below will list specific areas of task division:

<u>Task</u>	<u>Responsibility</u>		
	<u>Grumman Bethpage</u>	<u>Grumman Lausanne</u>	<u>Piccard</u>
<u>Mission Related Tasks:</u>			
Mission profile definition	x		
Power profile	x		
Maneuvering requirements	x		
Scientific objectives	x		
Instrumentation and experiments	x		
<u>Applied Loads</u>	x		
<u>Design Verification:</u>			
Compliance with GAEC techniques		x	
Establishment of design margin		x	
Certification			x
<u>Vehicle Design:</u>			
Life support, general	x		
Breathing atmosphere	x		
Temperature and humidity control	x		
Potable water (hot)	x		
Wash water	x		
Food	x		
Waste Management	x		
Clothing	x		
Fire Extinguishing	x		

<u>Task</u>	<u>Responsibility</u>		
	<u>Grumman Bethpage</u>	<u>Grumman Lausanne</u>	<u>Piccard</u>
<u>Vehicle Structural Design:</u>			
Pressure hull geometry			x
Pressure hull division	x		
Hard points	x		
Conning Tower, ballast, deck, battery box, interior, etc.			x
<u>Propulsion System:</u>			
Motors selection	x		
Battery selection	x		
Inverter selection	x		
Propulsion installation & Control System			x
<u>Controls and Displays</u>			
<u>Electrical Power System</u>			
			x
<u>Trim and Ballast System</u>			
			x
<u>Communication</u>			
	x		
<u>Navigation</u>			
	x		
<u>Fluid Power:</u>			
Hydraulic			x
Pneumatic			x
<u>Support Equipment (shore site)</u>			
	x		

4. SERVICES FOR WHICH GRUMMAN IS RESPONSIBLE

Grumman maintains overall supervision responsibility for the complete PX-15 but has delegated system responsibility for vehicle construction and initial test with Piccard. To aid in the design verification, specification and certification compliance, two resident engineers will be maintained at Lausanne, Switzerland. In addition, Grumman will supply the Life Support System.

4.1 Resident Systems Engineer

On or before August 1, 1966, Grumman will supply a Resident Systems Engineer to work at Lausanne, Switzerland, for the duration of the PX-15 design, construction and the European acceptance trials. The Resident Systems Engineer will be the senior Grumman man at Lausanne and will be responsible for the Grumman approval of all vehicle systems.

The Resident Systems Engineer will be responsible for all engineering liaison between the Grumman Bethpage, and the Lausanne operation. He will keep a current account of all progress on the PX-15, reporting this progress weekly to Grumman Bethpage. Vehicle construction problems, or design problems, requiring the assistance of Grumman Bethpage personnel will be reported immediately. The orderly transmittal of all engineering data will be coordinated by the Resident Systems Engineer. All transfer of documents between Lausanne and Bethpage will require his signature. Design changes, and all new drawings, will require the signature of the Resident Systems Engineer.

The Resident Systems Engineer will also authorize the expeditious purchase of all items not specifically anticipated by this contract. This would include all miscellaneous systems, all small hardware, and emergency items, required to achieve the Major Milestones (Appendix B).

The Resident Systems Engineer will also interpret suggested changes initiated by Bethpage in order to insure their accomplishment in the production vehicle with minimum impact on schedule.

All Engineering Reports prepared by Piccard will require the signature of the Resident Systems Engineer. The purpose of his signature is to insure the proper content of each report and the coordination of the report with respect to the overall project. The Resident Systems Engineer will not be responsible for the accuracy of the data presented, and will sign documents without delay, providing the content is adequately presented. Where a question arises as to the technical accuracy, reports will be signed with reservation, and the matter reported immediately to Grumman Bethpage for evaluation.

The Resident Systems Engineer will be adequately familiar with the content of all reports to identify inconsistencies, and other areas which appear questionable, and which would be generally of concern to Grumman Bethpage.

4.2 Resident Structural Engineer

On or before August 1, 1966, Grumman will supply a Resident Structural Engineer to work at Lausanne, Switzerland, for the duration of the PX-15 design, construction and the European acceptance trials.

The Resident Structural Engineer will be responsible for Grumman approval of the structural adequacy of the vehicle. He will monitor the structural design of the vehicle as well as approve all reports and drawings.

Also, he will maintain cognizance of Piccard's efforts with the American Bureau of Shipping, London, to assure vehicle certification.

He will determine adequacy of construction techniques and assure that the construction meets American Bureau of Shipping requirements.

4.3 Transient Technical Help

Grumman will supply occasional technical specialists on a transient basis in Lausanne, Switzerland, whenever a requirement exists in the opinion of the Resident Systems Engineer.

4.4 Grumman Bethpage

Grumman will supply a staff of at least five engineers in Bethpage in order to provide the timely technical support for the PX-15 project described in Paragraph 3, "Piccard/Grumman Task Division."

4.5 Life Support System

Grumman is responsible for the design, development and fabrication of the Life Support Systems. This will include any interim systems that may be required and the ultimate system along with any necessary spares or expendable materials.

The Atmosphere Control System is defined to include all components that are required to maintain an air supply that will have a temperature in the range of 65°F to 80°F; a relative humidity of 65% ± 20%; O₂ content not less than 20%; and a CO₂ content not in excess of 1%. In addition, the Life Support System will include the Potable Hot Water System designed to supply water for food preparation at temperatures not less than 150°F (this includes insulated storage tanks). The wash water reclamation and pumping system (the wash water tanks will be built-in by Piccard); the food supply for 6 men for 42 days (storage will be Piccard's responsibilities); the waste management system including special toilets, urinals and associated waste holding tanks; fire extinguishers. All the above items will be designed, developed and fabricated or procured by Grumman and installed on the vehicle by Piccard.

Grumman will submit an envelope requirement to Piccard on or before 1 August 1966.

Piccard will submit a drawing showing the proposed location for the systems to Grumman on or before July 1, 1966.

Grumman will inform Piccard of the Electrical Power Load Profile for the systems on or before August 1, 1966.

Grumman will submit to Piccard a technical description of the operation and maintenance of the systems on or before September 1, 1966.

Grumman will deliver the systems to Piccard on or before October 15, 1966. These systems will be installed by Piccard's employees under the cognizance of the Grumman Resident Systems Engineer. Grumman will supply the necessary spares and expendables to support the vehicle's operation for the equivalent of one month mission. If the final systems are not available at that date, Grumman will provide interim systems that will be adequate to sustain the European Acceptance Trials. In the latter case, the ultimate systems will be installed in the United States by Grumman.

5. SERVICES FOR WHICH PICCARD IS RESPONSIBLE

As Systems Manager for the PX-15 vehicle, it is Piccard's responsibility for all organizational work required for the design, construction, American Bureau of Shipping certification, schedule and initial trials for the vehicle. It is understood that Piccard will devote approximately 3/4 of his time to the PX-15 project prior to initial trials. The remainder of his time is to be in accordance with the Agreement dated the first day of February, 1966. Commencing 1 June 1966 regular employees of Piccard will devote full time to the PX-15 project and its missions constituting a minimum of 4 and $\frac{1}{2}$ man-years per year. In addition, Piccard will hire the following additional labor for a period of one year per man to commence as soon as practical:

1. Two draftsmen
2. One engineer
3. The equivalent of 1 man-year of part-time Giovanola Brothers, S.A. labor.

6. PURCHASING AND COST LIMITATION

Grumman is to purchase the major PX-15 systems with purchase orders issued from Bethpage. Although Piccard is responsible for the successful accomplishment of these major systems, their purchase is not part of his financial responsibility.

The payment for these systems will be made by Grumman through Piccard's office. Purchase orders will be initiated at Grumman Bethpage and forwarded to Piccard who will contact the respective suppliers for a quote to Grumman Bethpage via Piccard.

These major systems are:

- a) Motor
- b) Inverter
- c) Battery
- d) Hull

As it will be fabricated by Giovanola Brothers, S.A., the hull consists of a complete structural assembly including the keel, the ballasts and the reinforcement rings and provision for the installation of the viewing ports, battery boxes, and hatches. Giovanola will heat treat this assembly.

This separate contract with Giovanola will be written to include (2) spare hemispherical blanks. It will also include any tooling that will be required to locate holes on the flange of hull sections that may be added to the PX-15 in subsequent configurations.

Any additional hull equipment is covered by Appendix A and is considered part of Piccard's financial responsibility. Piccard is to purchase all items described in Appendix A.

7. PAYMENT

For the additional labor referred to in Article ⁵ / Piccard is to be paid a total of \$60,000 at the rate of \$5,000 per month. These sums are the total reimbursement for the salaries and overhead expenses of such additional labor and includes all expenses such as wages, sick leave, vacations, contributions to pension or retirement plans, taxes, depreciation, repairs, maintenance, insurance, telephone and local travel and subsistence. Office equipment in excess of a value of \$ _____ shall become the property of Piccard.

Piccard is to be paid for the purchase of items listed in Appendix A by using a demand account maintained by Grumman at the Banque Cantonale Vandoise, Lausanne. Checks drawn on this account are to be signed both by Piccard and the Resident Grumman Systems Engineer. An initial deposit of \$100,000 is to be made by 15 June 1966 and the account maintained at a minimum of \$50,000 until lake tests are completed.

Piccard is to be paid a design fee in the amount of \$150,000 as provided for herein. \$50,000 shall be paid upon execution of this Agreement and \$100,000 upon successful completion and demonstration of the vehicle in Europe as elsewhere specified herein.

Upon the payment of the \$150,000 design fee, Grumman will be considered the design owner. Grumman may build additional units, permit others to build units or sell the design, without additional payment to Piccard.

8. COST REPORTS

A cost limitation is described in Appendix A.

Piccard is to report expenditures against the cost limits of Appendix A on the 15th day of each month for the period through the end of the previous month. These reports are to be signed by the Resident Systems Engineer. These reports shall indicate: (1) costs incurred through the end of the previous month; (2) funds obligated, and; (3) the current prediction of cost at completion for each item in Appendix A.

In the event any item exceeds its cost limit, Piccard shall demonstrate that another will be sufficiently below to keep the total under the limit. Such demonstration must be documented with legal contract offers and shall be to the satisfaction of Walter Scott of Grumman.

In the event cost cannot be maintained according to the limit or the conditions described above, the parties shall enter into a negotiation to decide upon a revised course of action for the PX-15 program.

9. DOCUMENTATION

In order to monitor construction and insure compliance with the vehicle design specifications and certification requirements, specific documentation will be required. The on-site Grumman Engineering representatives will monitor design and construction progress through the documentation reports.

9.1 Purpose

The purpose of these reports is to:

- o Insure compliance with the specifications.
- o Record what was actually done in order to facilitate subsequent changes.
- o Indicate the reasons for what was done to benefit future designs.
- o Insure the safety of personnel by allowing a comprehensive review of all systems prior to launch of the vehicle.
- o Meet American Bureau of Shipping certification requirements for documentation.

9.2 Report Listing

The documentation will consist of both preliminary and final reports which describe the systems listed below:

- Basic pressure hull
- Electrical power supply
- Hydraulic and pneumatic system
- Life support - breathing atmosphere (from Grumman Bethpage)
- Life support - general
- Navigation and control
- Ballast and trim system
- Propulsion system
- Safety systems
- Support requirements

9.3 Timing

The reports should be available for Grumman perusal in time for Grumman Bethpage to render aid in an instance of an unexpected problem. Preliminary reports should be submitted to the on-site Grumman Resident Systems Engineer no later than two months prior to launch. Final reports may be submitted within two months of the project completion.

9.4 Content

The content of the reports should be as concise as possible, consistent with the subsystems described. The intent is to present adequate data to completely describe each subsystem. This will include drawings of all parts not purchased, and performance capabilities when applicable. Each report will include a recommendation for operational spares that will be required to support the operation of the FX-15 through 1967. Each report must include a handbook section describing how to operate each subsystem. Grumman intends to maintain the production schedule by not imposing unnecessary documentation, and for this reason, the content is not outlined here in detail.

9.5 Approval

Generally, all reports will be approved by the Grumman Resident Systems Engineer at the construction site, subject to review at Grumman Bethpage. Grumman approval of any subsystem design does not relieve Piccard of the responsibility of meeting performance specifications.

If upon careful examination of a preliminary subsystem report, Grumman determines that a change is required, such changes will be made upon mutual agreement with Piccard. Major changes which affect either schedule or cost will require negotiation, so that alternatives may be considered for minimum impact on either cost or schedule.

9.6 Compliance with Specifications

A preliminary set of PX-15 performance and design specifications is included as part of this contract. A final set of mutually agreed upon specifications will be determined prior to August 15, 1966. The requirements of these final specifications will describe in detail the vehicle and its performance. The vehicle will be expected to meet these requirements to Grumman's satisfaction.

It is recognized that there is interdependence between the Piccard design task and the Grumman supplied life support system. Piccard will be relieved of responsibility of performance compliance in those areas effected by the Grumman life support system if it does not meet its specification or production delivery date.

10. SCHEDULE

Present plans call for Drift Mission use of the vehicle during early summer 1967. The Drift Mission can be completed only during the summer months, May through July. Therefore, 1967 drift accomplishment will depend upon completion of the demonstration test in Lake Geneva by 1 April 1967.

If the demonstration as described in Section 4 of this contract is not completed prior to 1 April 1967, Drift Mission operation will be postponed until 1968. In this case, operational development of the vehicle will be conducted in Europe.

Grumman shall determine whether there is sufficient support for the Draft Mission in scientific circles by 1 September 1966. This determination is predicated on Piccard furnishing a report of support for such mission and Piccard shall submit such report to be received not later than 15 August 1966 which shall list committed, as well as expected, financial and material support for the drift program. If Grumman determines to proceed with the Drift Mission, such determination is for 1967 only and will not apply to a Drift Mission for 1968, if 1968 becomes a consideration.

11. PROGRESS REPORTING

Progress reports shall be made to Grumman Bethpage every two weeks in accordance with the schedule plan, Appendix B. The report will indicate whether an event has occurred or what the current predicted date is for each event in Appendix B.

Any recommended changes to the schedule plan as the program evolves shall be reviewed by the Grumman Resident Systems Engineer and submitted to Walter Scott.

12. TESTING AND DEMONSTRATION

The vehicle and all subsystems will be adequately tested to insure system performance and safety before the European acceptance trial.

12.1 System Performance Tests

Testing - Tests devised by Piccard and approved and witnessed by the Grumman Resident Systems Engineer will be performed on the following major subsystems:

Hull - leak test all seals, observation ports and hatches

16

Electrical Power Subsystem - including an exercise of the batteries that will be the equivalent of (4) Drift Mission-recharge cycles.

Propulsion System

Life Support

Vehicle Navigation and Control - Underwater Stability

Ballast System

Hydraulics and Pneumatics.

The tests will be devised to prove system capability in compliance with specification requirements. In general, testing should follow a procedure of gradual build-up to maximum capability to insure adequate safety for personnel.

No public disclosure or witnessing of any tests is to be permitted before the final acceptance demonstration.

12.2 European Acceptance Trial

Upon satisfactory completion of the subsystem tests, the PX-15 will be approved for the European Acceptance Trials. This will be done in Europe, and will demonstrate total vehicle capability.

The vehicle will be required to perform the following mission profile with a Grumman observer on board and with all major systems operating and with weight compensation to approximate the Drift Mission configuration.

- (1) Cruise 10 km on the surface at or above 4 knots.
- (2) Dive to a depth of 300 meters, remaining stabilized at 300 meters ± 20 meters for 10 minutes.
- (3) Climb to 100 meters and cruise submerged for a distance of 10 km at 3 knots or faster.
- (4) Redive to 300 meters, remaining at 300 meters ± 20 meters for 10 minutes.
- (5) Return to the surface and cruise back 10 km at a speed of 4 knots or greater.
- (6) Demonstrate emergency procedure in harbor.
- (7) Recharge batteries

Approval of the European Acceptance Trials will be contingent on the satisfactory operation of all primary subsystems. Minor malfunctions which do not affect crew safety will not invalidate the European Acceptance Trials. Failure of major subsystems to perform to specification requirements during the trials will require either a complete repeat of the mission profile, or with Grumman approval, repeat of an appropriate portion of the trial. All of this mission to be done without external power or support, except telephone.

^{10.}
13 Article 3 Termination

(a) This contract shall terminate automatically in the event that Piccard should die prior to the contemplated expiration of the contract. Such termination shall become effective on the date of Piccard's death, and Grumman shall thereafter have no further obligation to make payments ~~under Article 3 hereof~~ except for services rendered and reimbursable expenses incurred by Piccard or his employees prior to the date of death.

(b) This contract may also be terminated by Grumman on fifteen (15) days' advance written notice if Piccard shall be prevented from performing his personal services hereunder by reason of illness or injury for a period of thirty (30) successive days. Grumman's notice shall specify the date on which such termination shall become effective. Either party may terminate this contract upon fifteen (15) days' advance notice to the other if the other party shall be unable, by force majeure, to carry out his obligations under this contract, either wholly or in part; provided that the period during which the force majeure prevented such performance shall have extended not less than thirty (30) days. As used herein the term "force majeure" shall mean acts of God, strikes or other industrial disturbances, wars, explosions, fires, floods or any other cause not within the control of the party whose performance is prevented and without such party's fault or negligence.

^c
(d) Following termination under paragraph ~~(a)~~ or (b) of this Article ¹⁰ ~~8~~ the respective obligations and rights of the parties hereunder shall terminate except for those obligations which continue beyond the normal expiration of the contract.

(d) In the event of termination of this contract prior to the formal acceptance of the PX-15 by Grumman, all hardware and software related to the PX-15 and in the possession of Piccard's office or employees shall become the immediate property of Grumman. Furthermore, any outstanding design or construction obligations made by Piccard relating to the PX-15 shall be assumed by Grumman, provided that such obligations have been entered into as provided for elsewhere herein.

14 ~~Article 11.~~ Formal Acceptance and Operation of the PX-15

The PX-15 shall be formally accepted by Grumman and become Grumman's sole property and responsibility upon Piccard's earning of the final payment of the design fee as provided for elsewhere in this contract. At such formal acceptance, or as soon thereafter as is practical^{ly}, the parties shall enter into negotiations for a contract to describe the specific plans for utilizing the PX-15 and the responsibilities of Grumman and Piccard.

15 ~~Article 9.~~ Notices

Any notices to be given hereunder shall be deemed sufficiently given if sent in writing or by cable to the other party at the address first above written. Notices to Grumman shall be sent to the attention of Walter Scott, and all notices and approvals to be given by Grumman shall be given by Mr. Scott or such other person as Grumman may designate in writing.

Fred

GRUMAN/PICCARD PX-15 CONTRACT

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CONTRACT1. PURPOSE

This agreement, effective as of the first day of June 1966, by and between Grumman Aircraft Engineering Corporation, a New York corporation, having its principal place of business at Bethpage, New York (hereinafter referred to as "Grumman"), and Jacques Piccard, an individual, residing at 9 Chemin de Fontanettaz, 1012 Lausanne, Switzerland (hereinafter referred to as "Piccard").

On the first day of February 1966, Grumman and Piccard entered into a five year contract covering the services of Piccard to Grumman in the fields of oceanography and ocean engineering. Article 4 of this five year contract entitled Construction of Vehicle described a joint study of an undersea vehicle called the PX-15 with requirements for a construction contract should the parties agree to undertake construction of the vehicle.

On 18 May, a decision was made by Grumman management to proceed with the construction of the PX-15 vehicle. The decision to proceed follows:

"... to proceed with the European construction of the PX-15 modified to incorporate two, flange-type separations permitting future insertion of alternate sections and also modified to include mounting areas for future addition of a manipulator, legs and other accessories and that initial planned use of the PX-15 be the Gulf Stream Drift Mission. Piccard is to pursue outside support of the Drift Mission."

This contract is an agreement between Grumman and Piccard for the construction of the PX-15 modified as specified above.

2. DESCRIPTION OF THE MODIFIED PX-15 VEHICLE

The modified PX-15 is an underwater work vehicle with a collapse depth of 4000 feet and a capability for long periods of submerged operation. It can carry up to 10 men and all types of scientific and experimental payloads. This submarine vehicle has provisions for convertability. Interchangeable sections will allow various scientific experiments, diver systems, and other alternative configurations to utilize the basic propulsion and control part of the vehicle.

Propulsive power is provided by four 25 horsepower electric motors, each having variable thrust level and direction for control.

The vehicle will have sufficient structural rigidity to remain stable at depth in the water.

The vehicle will meet American Bureau of Shipping certification requirements.

A complete description of the vehicle is contained in Appendix C, entitled "PX-15 General Specification."

3. PICCARD/GRUMMAN TASK DIVISION

In general, systems management for the PX-15 will be the responsibility of Piccard. Grumman assistance will be in the areas of hull structural verification, mission profile and objectives and miscellaneous technical advise as requested. The specific tasks that follow will supplement and expand upon this philosophy.

<u>Task</u>	<u>Responsibility</u>		
	<u>Grumman Bethpage</u>	<u>Grumman Lausanne</u>	<u>Piccard</u>
<u>Mission Related Tasks:</u>			
Mission profile definition	x		
Power profile	x		
Maneuvering requirements	x		
Scientific objectives	x		
Instrumentation and experiments	x		
<u>Applied Loads</u>	x		
<u>Design Verification:</u>			
Compliance with GAEC techniques		x	
Establishment of design margin		x	
Certification			x
<u>Vehicle Design:</u>			
Life support, breathing atmosphere	x		
Life support, general	x		
Temperature and humidity control	x		
Potable water	x		
Wash water	x		
Food	x		
Waste management	x		
Clothing	x		
Fire Extinguisher	x		
Medical	x		

<u>Task</u>	<u>Responsibility</u>		
	<u>Grumman Bethpage</u>	<u>Grumman Leusanne</u>	<u>Piccard</u>
<u>Vehicle Structural Design:</u>			
Pressure hull geometry			x
Pressure hull division	x		
Hard points	x		
Conning Tower, ballast, deck, battery box, interior, etc.			x
<u>Propulsion System:</u>			
Motors selection	x		
Battery selection	x		
Inverter selection	x		
Speed control system			
Thrust vector controls			
Propulsion installation			x
<u>Controls and Displays</u>			
<u>Electrical Power System</u>			
			x
<u>Trim and Ballast System</u>			
			x
<u>Communication</u>			
			x
<u>Navigation</u>			
			x
<u>Fluid Power:</u>			
Hydraulic			x
Pneumatic			x
<u>Support Equipment</u>			
	x		

4. SERVICES FOR WHICH GRUMMAN IS RESPONSIBLE

Grumman maintains overall supervision responsibility for the complete PX-15 but has vested system responsibility for vehicle construction and initial test with Piccard. To aid in the design verification, specification and certification compliance, two resident engineers will be maintained at Lausanne, Switzerland. In addition, Grumman will supply the Life Support System.

4.1 Resident Systems Engineer

On or before August 1, 1966, Grumman will supply a Resident Systems Engineer to work at Lausanne, Switzerland, for the duration of the PX-15 design, construction and the European acceptance trials. The Resident Systems Engineer will be the senior Grumman man at Lausanne and will be responsible for the Grumman approval of all vehicle systems.

The Resident Systems Engineer will be responsible for all engineering liaison between the Grumman Bethpage, and the Lausanne operation. He will keep a current account of all progress on the PX-15, reporting this progress weekly to Grumman Bethpage. Vehicle construction problems, or design problems, requiring the assistance of Grumman Bethpage personnel will be reported immediately. The orderly transmittal of all engineering data will be coordinated by the Resident Systems Engineer. All transfer of documents between Lausanne and Bethpage will require his signature. Design changes, and all new drawings, will require the signature of the Resident Systems Engineer.

The Resident Systems Engineer will also authorize the expeditious purchase of all items not specifically anticipated by this contract. This would include all miscellaneous systems, all small hardware, and emergency items, required to achieve the Major Milestones (Appendix B).

The Resident Systems Engineer will also interpret suggested changes initiated by Bethpage in order to insure their accomplishment in the production vehicle with minimum impact on schedule.

All Engineering Reports prepared by Piccard will require the signature of the Resident Systems Engineer. The purpose of his signature is to insure the proper content of each report and the coordination of the report with respect to the overall project. The Resident Systems Engineer will not be responsible for the accuracy of the data presented, and will sign documents without delay, providing the content is adequately presented. Where a question arises as to the technical accuracy, reports will be signed with reservation, and the matter reported immediately to Bethpage for evaluation.

The Resident Systems Engineer will be adequately familiar with the content of all reports to "spot" inconsistencies, and other areas which appear questionable, and which would be generally of concern to Grumman Bethpage.

4.2 Resident Structural Engineer

On or before August 1, 1966, Grumman will supply a Resident Structural Engineer to work at Lausanne, Switzerland, for the duration of the PX-15 design, construction and the European acceptance trials.

The Resident Structural Engineer will be responsible for Grumman approval of the structural adequacy of the vehicle. He will monitor the structural design of the vehicle as well as approve all reports and drawings.

Also, he will maintain cognizance of Piccard's efforts with the American Bureau of Shipping, London, to assure vehicle certification.

He will determine adequacy of construction techniques and assure that the construction meets American Bureau of Shipping requirements.

4.3 Transient Technical Help

Grumman will supply occasional technical specialists on a transient basis in Lausanne, Switzerland, whenever a requirement exists in the opinion of the Resident Systems Engineer.

4.4 Grumman Bethpage

Grumman will supply a staff of at least five engineers in Bethpage in order to provide the timely technical support for the PX-15 project described in Paragraph 3, "Piccard/Grumman Task Division."

4.5 Life Support System

Grumman is responsible for the design, development and fabrication of the Life Support Systems. This will include any interim systems that may be required and the ultimate system along with any necessary spares or expendable materials.

The Atmosphere Control System is defined to include all components that are required to maintain an air supply that will have a temperature in the range of 65°F to 80°F; a relative humidity of 55% ± 15%; O₂ content not less than 20%; and a CO₂ content not in excess of 1%. In addition, the Life Support System will include the Potable Hot Water System designed to supply water for food preparation at temperatures not less than 150°F (this includes insulated storage tanks). The wash water reclamation and pumping system (the wash water tanks will be built-in by Piccard); the food supply for 6 men for 42 days (storage will be Piccard's responsibilities); the waste management system including special toilets, urinals and associated waste holding tanks; fire extinguishers. All the above items will be designed, developed and fabricated by Grumman and installed on the vehicle by Piccard.

Grumman will submit an envelope requirement to Piccard on or before June 15, 1966.

Piccard will submit a drawing showing the proposed location for the systems to Grumman on or before July 1, 1966.

Grumman will inform Piccard of the Electrical Power Load Profile for the systems on or before August 1, 1966.

Grumman will submit to Piccard a technical description of the operation and maintenance of the systems on or before September 1, 1966.

Grumman will deliver the systems to Piccard on or before October 15, 1966. These systems will be installed by Piccard's employees under the cognizance of the Grumman Resident Systems Engineer. Grumman will supply the necessary spares and expendables to support the vehicle's operation for the equivalent of a one month mission. If the final systems are not available at that date, Grumman will provide interim systems that will be adequate to sustain the European acceptance trials. In the latter case, the ultimate systems will be installed in the United States by Grumman.

5. SERVICES FOR WHICH PICCARD IS RESPONSIBLE

It is understood that Piccard will devote approximately 3/4 of his time to the PX-15 project prior to initial trials. The remainder to be general oceanographic/ocean engineering, marketing, etc., as specified by Mr. Walter Scott of Grumman.

Piccard is the Systems Manager for the PX-15 vehicle construction, systems performance tests and the European acceptance trials. This means that all organizational work required for the design, construction, American Bureau of Shipping certification, schedule and initial trials for the vehicle will be handled through Piccard's office and be his responsibility. Financial arrangements will be handled through Piccard's office but with specific Grumman approval.

It shall also be Piccard's responsibility that the PX-15 be well designed and constructed according to best commercial practice in a good and workman manner.

5.1 Employees of Piccard - Services

Commencing 1 June 1966, regular employees of Piccard will devote full time to the PX-15 and its missions, constituting a minimum of 4 and $\frac{1}{2}$ man-years per year.

5.2 Additional Employees of Piccard - Services

Piccard will hire the following additional labor for a period of one year per man to commence as soon as practical:

- o Two draftsmen
- o One engineer
- o The equivalent of 1 man-year of part-time Giovanola labor.

Piccard is to pay the salaries and overhead expenses of these people. Overhead is to include all expenses of employment such as office space and equipment, telephone, local travel, etc. Office equipment is to become the property of Piccard.

Piccard to be paid a total not to exceed \$60,000 for the above additional labor and expenses, at the rate of approximately \$5,000 per month. Grumman is to be billed for an amount equal to the cost to Piccard.

6. PURCHASES TO BE NEGOTIATED UNDER SEPARATE CONTRACTS

A fixed price contract will be negotiated for certain major systems. Although Piccard is responsible for the successful accomplishment of these major systems, their purchase is not part of his financial responsibility.

The payment for these systems will be made by Grumman through Piccard's office. Purchase orders will be initiated at Grumman Bethpage and forwarded to Piccard who will contact the respective suppliers for a quote to Grumman Bethpage via Piccard.

These major systems are:

- a) Motor
- b) Inverter
- c) Battery
- d) Hull

As it will be fabricated by Giovanola Brothers S.A., the hull consists of a complete structural assembly including the keel, the ballasts and the reinforcement rings and provision for the installation of the viewing ports, battery boxes, and hatches. Giovanola will heat treat this assembly.

This separate contract with Giovanola will be written to include (2) spare hemispherical blanks. It will also include any tooling that will be required to locate holes on the flange of hull sections that may be added to the PX-15 in subsequent configurations.

Any additional hull equipment is covered by Appendix A and is considered part of Piccard's financial responsibility.

7. PURCHASES FOR WHICH PICCARD IS RESPONSIBLE

A cost limit has been established for the PX-15 program. This cost limit is described in Appendix A. The cost limit covers the complete PX-15 vehicle with the exception of the items described in Paragraph 6.

Piccard is to purchase all items described in Appendix A and is to maintain cost accounting and cost control over all items listed.

Payments for items on this list will be made by Piccard through a demand account maintained by Grumman for PX-15 development at the Banque Cantonale Vaudoise, Lausanne. Checks drawn on this account are to be signed both by Piccard and the Resident Grumman Systems Engineer. An initial deposit of \$100,000 is to be made by 15 June 1966 and the account maintained at a minimum of \$50,000 until lake tests are completed.

8. COST REPORTS

Piccard is to report expenditures against the cost limits of Appendix A on the 15th day of each month for the period through the end of the previous month. These reports are to be signed by the Resident Systems Engineer. These reports shall indicate: (1) costs incurred through the end of the previous month; (2) funds obligated, and; (3) the current prediction of cost at completion for each item in Appendix A.

In the event any item exceeds its cost limit, Piccard shall demonstrate that another will be sufficiently below to keep the total the limit. Such demonstration must be documented with legal contract offers and shall be to the satisfaction of Walter Scott of Grumman.

In the event cost cannot be maintained according to the limit or the conditions described above, the parties shall enter into a negotiation to decide upon a course of action for the PX-15 program.

9. DOCUMENTATION

In order to monitor construction and insure compliance with the vehicle design specifications and certification requirements, specific documentation will be required. The on-site Grumman Engineering representatives will monitor design and construction progress through the documentation reports.

9.1 Purpose

The purpose of these reports is to:

- o Insure compliance with the specifications.
- o Record what was actually done in order to facilitate subsequent changes.
- o Indicate the reasons for what was done to benefit future designs.
- o Insure the safety of personnel by allowing a comprehensive review of all systems prior to launch of the vehicle.
- o Meet American Bureau of Shipping certification requirements for documentation.

9.2 Report Listing

The documentation will consist of both preliminary and final reports which describe the systems listed below:

Basic pressure hull

Electrical power supply

Hydraulic and pneumatic system

Life support - breathing atmosphere (from Grumman Bethpage)

Life support - general

Navigation and control

Ballast and trim system

Propulsion system

Hydrodynamic analysis.

9.3 Timing

The reports should be available for Grumman perusal in time for Grumman Bethpage to render aid in an instance of an unexpected problem. Preliminary reports should be submitted to the on-site Grumman Resident Systems Engineer no later than two months prior to launch. Final reports may be submitted within two months of the project completion.

9.4 Content

The content of the reports should be as concise as possible, consistent with the subsystems described. The intent is to present adequate data to completely describe each subsystem. This will include drawings of all parts not purchased, and performance capabilities when applicable. Each report will include a recommendation for operational spares that will be required to support the operation of the PX-15 through 1967.

Grumman intends to maintain the production schedule by not imposing unnecessary documentation, and for this reason, the content is not outlined here in detail.

9.5 Approval

Generally, all reports will be approved by the Grumman Resident Systems Engineer at the construction site, subject to review at Grumman Bethpage. Grumman approval of any subsystem design does not relieve Piccard of the responsibility of meeting performance specifications.

If upon careful examination of a preliminary subsystem report, Grumman determines that a change is required, such changes will be made upon mutual agreement with Piccard. Major changes which affect either schedule or cost will require negotiation, so that alternatives may be considered for minimum impact on either cost or schedule.

9.6 Compliance with Specifications

A preliminary set of PX-15 performance and design specifications is included as part of this contract. A final set of mutually agreed upon specifications will be determined prior to August 15, 1966. The requirements of these final specifications will describe in detail the vehicle and its performance. The vehicle will be expected to meet these requirements to Grumman's satisfaction.

It is recognized that there is interdependence between the Piccard design task and the Grumman supplied life support system. Piccard will be relieved of responsibility of performance compliance in those areas effected by the Grumman life support system if it does not meet its specification or production delivery date.

10. SCHEDULE

Present plans call for Drift Mission use of the vehicle during early summer 1967. The Drift Mission can be completed only during the summer months, May through July. Therefore, 1967 drift accomplishment will depend upon completion of the demonstration test in Lake Geneva by 1 April 1967.

If the demonstration as described in Section 4 of this contract is not completed prior to 1 April 1967, Drift Mission operation will be postponed until 1968. In this case, operational development of the vehicle will be conducted in Europe.

11. PROGRESS REPORTING

Progress reports shall be made to Grumman Bethpage every two weeks in accordance with the schedule plan, Appendix B. The report will indicate whether an event has occurred or what the current predicted date is for each event in Appendix B.

Any recommended changes to the schedule plan as the program evolves shall be reviewed by the Grumman Resident Systems Engineer and submitted to Walter Scott.

12. TESTING AND DEMONSTRATION

The vehicle and all subsystems will be adequately tested to insure system performance and safety before the European acceptance trial.

12.1 System Performance Tests

Testing - Tests devised by Piccard and approved and witnessed by the Grumman Resident Systems Engineer will be performed on the following major subsystems:

Hull - leak test all seals, observation ports and hatches

Electrical Power Subsystem - including an exercise of the batteries that will be the equivalent of (4) Drift Mission-recharge cycles.

Propulsion System

Life Support

Vehicle Navigation and Control - Underwater Stability

Ballast System

Hydraulics and Pneumatics.

The tests will be devised to prove system capability in compliance with specification requirements. In general, testing should follow a procedure of gradual build-up to maximum capability to insure adequate safety for personnel.

No public disclosure or witnessing of any tests is to be permitted before the final acceptance demonstration.

12.2 European Acceptance Trial

Upon satisfactory completion of the subsystem tests, the PX-15 will be approved for the European Acceptance Trials. This will be done in Europe, and will demonstrate total vehicle capability.

The vehicle will be required to perform the following mission profile with a Grumman observer on board and with all major systems operating and with weight compensation to approximate the Drift Mission configuration.

- (1) Cruise 10 km on the surface at or above 4 knots.
- (2) Dive to a depth of 300 meters, remaining stabilized at 300 meters ± 20 meters for 10 minutes.
- (3) Climb to 100 meters and cruise submerged for a distance of 10 km at 3 knots or faster.
- (4) Redive to 300 meters, remaining at 300 meters ± 20 meters for 10 minutes.
- (5) Return to the surface and cruise back 10 km at a speed of 4 knots or greater.
- (6) Demonstrate emergency procedure in harbor.
- (7) Recharge batteries.

Approval of the European Acceptance Trials will be contingent on the satisfactory operation of all primary subsystems. Minor malfunctions which do not affect crew safety will not invalidate the European Acceptance Trials. Failure of major subsystems to perform to specification requirements during the trials will require either a complete repeat of the mission profile, or with Grumman approval, repeat of an appropriate portion of the trial. All of this mission to be done without external power or support, except telephone.

13. FORMAL ACCEPTANCE AND DESIGN FEE

The February agreement, Article 4, subsection (r), specified a design fee of \$150,000. This fee is to be paid in two payments: \$50,000 on 1 June 1966, upon the signing of this agreement, and \$100,000 following successful completion of the European Lake Trials.

The PX-15 shall be formally accepted by Grumman and become Grumman's sole responsibility upon Piccard's receipt of final payment of \$100,000, subject to the terms of any other agreements that will be entered into between Piccard and Grumman.

14. TERMINATION

Same as prior agreement except (c). Add also:

In the event of termination of this contract prior to the formal acceptance of the PX-15 by Grumman, all hardware and software related to the PX-15 and in the possession of Piccard's office or employees shall become the immediate property of Grumman. Furthermore, any outstanding design or construction obligations made by Piccard relating to the PX-15 shall be assumed by Grumman, provided that such obligations have been entered into with the previous knowledge and approval of Grumman.

Formal acceptance of the PX-15 vehicle by Grumman shall terminate this contract.

15. NEXT CONTRACTS

At the time of the formal acceptance of the PX-15, a new contract will be written. This contract will describe the specific plans for utilizing the PX-15 and the responsibilities of Grumman and Piccard. Those plans will depend on the date of Formal Acceptance and the nature of the outside support of the proposed Drift Mission.

15.1 Drift Mission

The Grumman Corporation will decide whether sufficient outside support of the Drift Mission has been accumulated by 1 September 1966. This decision will follow receipt of a report from Piccard to be received not later than 15 August describing the result of his pursuit of outside support. This report is to list committed as well as expected financial and material support for the Drift Mission.

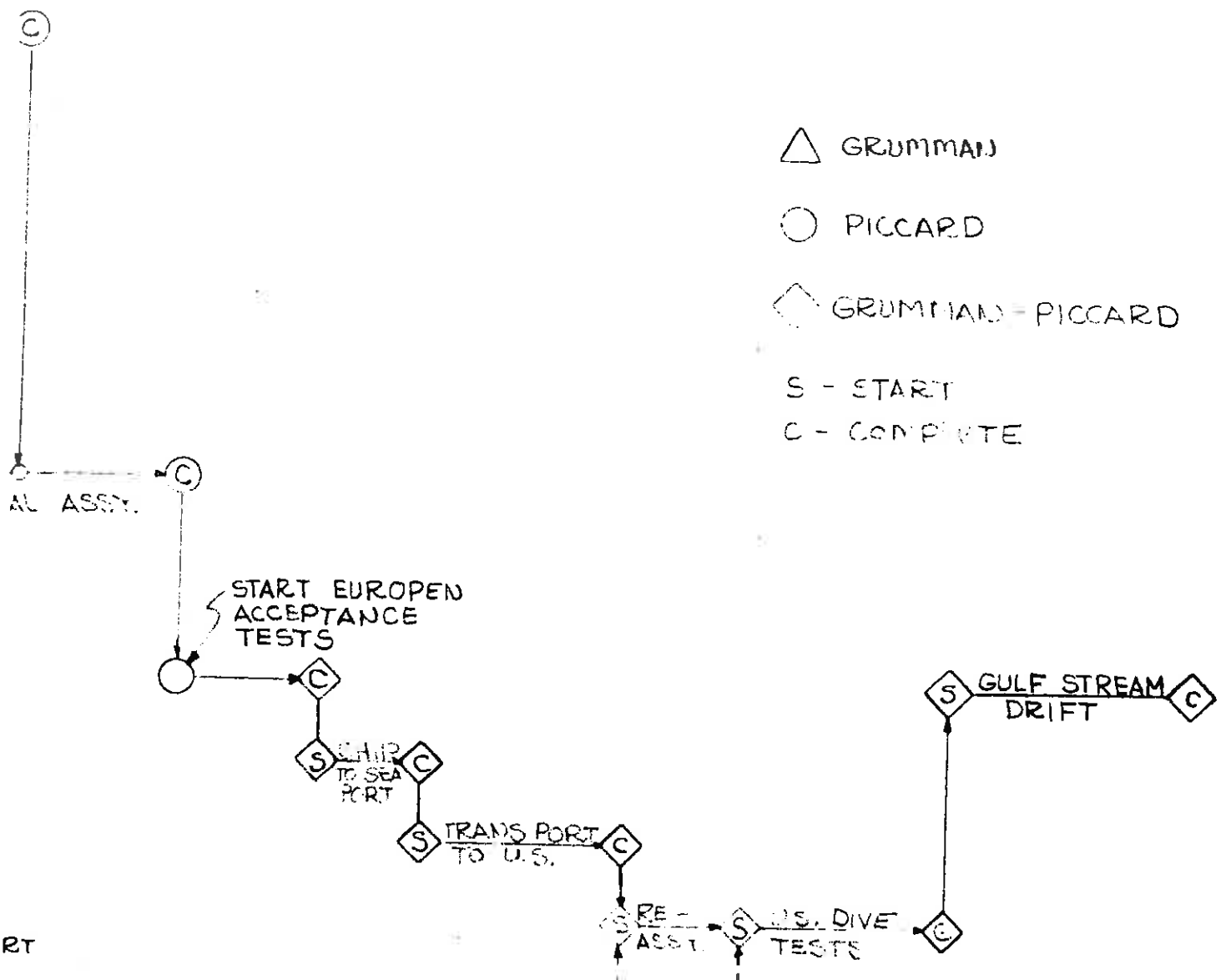
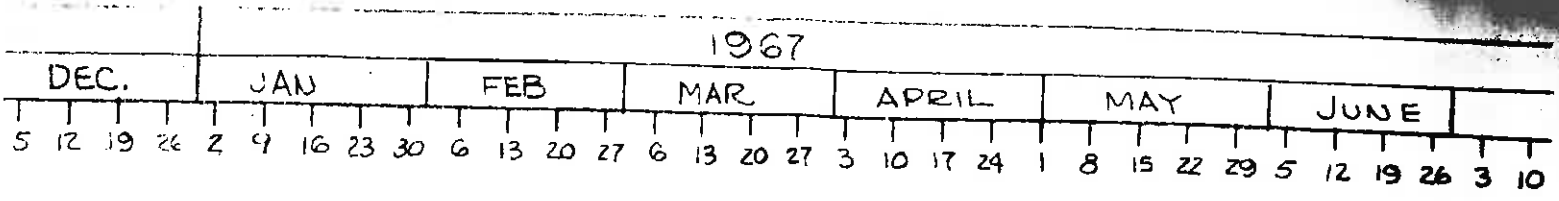
If the Grumman decision is to proceed with the Drift Mission, it is for 1967 only and will not apply to a Drift Mission for 1968, assuming 1968 becomes a consideration.

Appendix APX-15 Cost - Piccard Responsibility

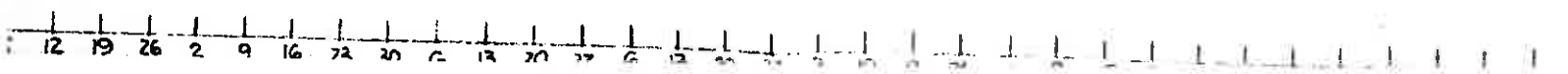
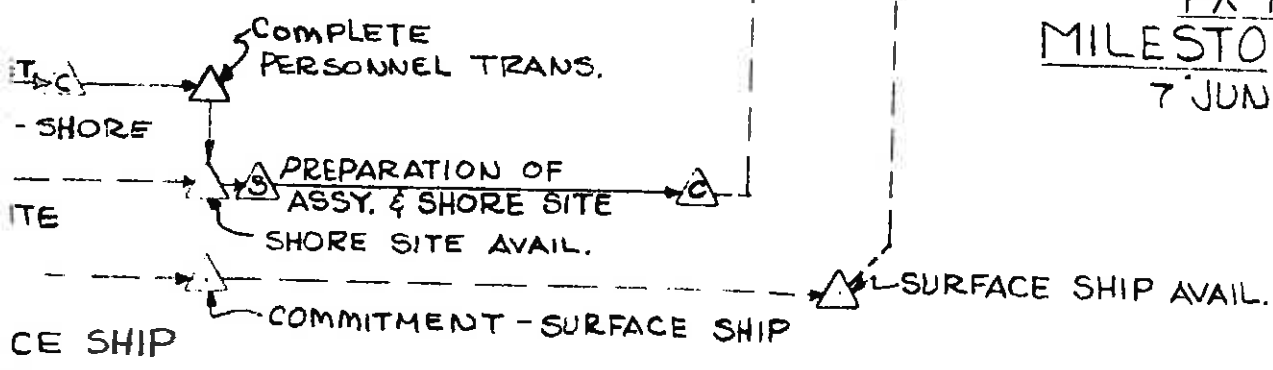
<u>Item</u>	<u>Cost Limit</u>
Hull Equipment, including Conning tower Trim tanks Plumbing and piping Valves Portholes Pumps - Hatches - Battery box	\$ 58,000
Electrical Fittings	20,000
Electrical Cables	3,000
Fathometer	15,000
Underwater Telephones (2)	20,000
Television Systems (2)	20,000
Main Pressure Gage	1,000
Search Lights	7,000
Magnetic Valves	6,000
Marine Equipments	8,000
Inside Fittings	5,000
Assembly Hardware	5,000
Battery Connectors	15,000
Outside Labor	40,000
European Acceptance Trial, including Shipyard	50,000
	<hr/>
	\$ 390,000
Contingency	50,000
	<hr/>
	\$ 440,000

Appendix BMajor Milestones

	<u>Planned</u>	<u>Actual</u>
1) Complete fabrication of aft hemisphere assembly	8/22/66	
2) Complete fabrication of aft cylindrical assembly	8/22/66	
3) Complete joining aft hemisphere/cylindrical assembly	9/5/66	
4) Complete stress relieving aft hemisphere/cylindrical assembly	9/12/66	
5) Complete fabrication of forward hemisphere assembly	8/30/66	
6) Complete fabrication of forward cylindrical assembly	9/5/66	
7) Complete stress relieving forward hemisphere/cylindrical assembly	9/19/66	
8) Start joining forward assembly/aft assembly and start final assembly	10/31/66	
9) Complete fabrication of ballast tanks assembly	11/14/66	
10) Complete fabrication of battery assembly	11/21/66	
11) Complete fabrication of conning tower	11/28/66	
12) Complete assembly of vehicle	1/2/67	
13) Complete European Acceptance Trials	1/25/67	
14) Start transport to U.S.	2/13/67	
15) Start re-assembly of major assembly	3/20/67	
16) Start U.S. dive tests	4/10/67	



PX-15
MILESTONE PLAN
 7 JUNE 1966



1966

MAY				JUNE				JULY				AUG.				SEPT.				OCT.				NOV.					
9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28

