

To:

FAX: W Thornton

483-6270 FAX

From B 124/

John Crawford

14 Pages

362-00

NO. MS0001-007
 DATE 4/26/90
 P.O. #
 VIA AIR-GRAND
 TERMS

ACTION: Repair of Single Board Drive

ATT: Electronic Repair

TO: Industrial Drives

201 Rock Road

Radford, VA 24141

SHIP TO: Electrospan Systems, Inc.

1405 N. Main, Suite 102

San Antonio, TX 78212-4351

PLEASE SHIP THE FOLLOWING:

DATE REQUIRED: 5/31/90

ORDERED	RECEIVED	STOCK NUMBER	DESCRIPTION	PRICE	PER	AMOUNT
1ea.		Repair	STD2-10-2101-2933CA2/160-10; S/N 7C-401	TBD		TBD
			NOTES:			
			1. Repair of the single board drive, S/N 7C-401, referenced above has been coordinated with Kim Orell at (703) 639-2495, Ext 320.			
			2. Board shall ^{fully} to output proper motor drive current.			
			3. Cost of repair shall be discussed with Larry Pechacek at ESI, ph# (512) 227-5651, prior to repair if estimated cost exceeds \$500.00.			
			4. Please advise ^{advise} Larry Pechacek of the repair and the required shipping schedule at ESI ph# (512) 227-5651.			
			5. Repaired board shall meet all factory specifications as applicable upon return to ESI.			

DATE RECEIVED AND DISPOSITION

ORDERED BY *Larry P. Pechacek*

ACTION: Repair of Single Board Drive

NO. H30C01-007

DATE 4/26/90

F.O.B.

VIA UPS GROUND

TERMS

ATT: Electronic Repair

TO: Industrial Drives

201 Rock Road

Radford, VA--24141

SHIP TO: Electroscan Systems, Inc.

1405 W. Main, Suite 102

San Antonio, TX 78212-4351

EASE SHIP THE FOLLOWING:

DATE REQUIRED: 5/31/90

ORDERED	RECEIVED	STOCK NUMBER	DESCRIPTION	PRICE	PER	AMOUNT
1ea.		Repair	SBD2-10-2101-2933CA2/160-10; S/N 7C-401	TBD		TBD
			NOTES:			
			1. Repair of the single board drive, S/N 7C-401, referenced above has been coordinated with Kim Orall at (703) 639-2493, Ext 320.			
			2. ^{tailg} board tailg to output proper motor drive current.			
			3. Cost of repair shall be discussed with Larry Pachacek at ESI, ph# (512) 227-5651, prior to repair if estimated cost exceeds \$500.00.			
			4. Please ^{advise} advise Larry Pachacek of the repair and the repair shipping schedule at ESI ph# (512) 227-5651.			
			5. Repaired board shall meet all factory specifications as applicable upon return to ESI.			

ATE RECEIVED AND DISPOSITION

ORDERED BY

L. D. Dick

ELECTROSPEC SYSTEMS, INC.*Engineering Excellence*

1405 N. Main, Suite 102

San Antonio, TX 78212-4351

(812) 227-6651

3 August 1990

Whitmore Enterprises
Route 5, Box 369
San Antonio, TX 78221
(512) 624-2121

S T A T E M E N T

Terms: Net 10

Industrial Drive Single Board Amplifier
Repair: S/N 7C-401

\$ 318.00

Total \$ 318.50

PAID

ELECTROSPEC SYSTEMS, INC.



March 11, 1991

Mr. Henry Whitmore
Whitmore Enterprises, Inc.
Route 5, Box 389
San Antonio, TX 78221

RE: NAS 918230, Item 5; Proposal No. 1209

Dear Mr. Whitmore:

Electrospec Systems, Inc. (ESI) is pleased to submit proposal No. 1209 for modification of the prototype ergometer delivered to Whitmore Enterprises in support of NAS 918230, Item 5. This proposal includes the selection, acquisition, and installation of an upgraded servo motor drive amplifier. Also included in the proposal is system control tests and minor software changes which will be required as a result of the upgrade.

The total cost of this proposal is \$4,800.00. ESI will deliver the modified Ergometer to Whitmore Enterprises fifteen working days after receipt of the servo motor component. Industrial Drives estimates approximately 8 weeks for delivery of the component. Therefore total effort time is estimated to be 8 weeks.

The proposed effort time line and cost is based upon the new component being the same form factor and providing the same system response characteristics as the unit now used. Industrial Drives application engineers have told ESI that these assumptions are correct.

If you have any questions concerning this proposal or if I can be of further assistance, please do not hesitate to contact me at (512) 227-5851. If this proposal meets with your satisfaction, ESI will commence work immediately upon receipt of a purchase order. The funding terms are 50% upon receipt of order, 50% upon delivery. Thank you for your consideration.

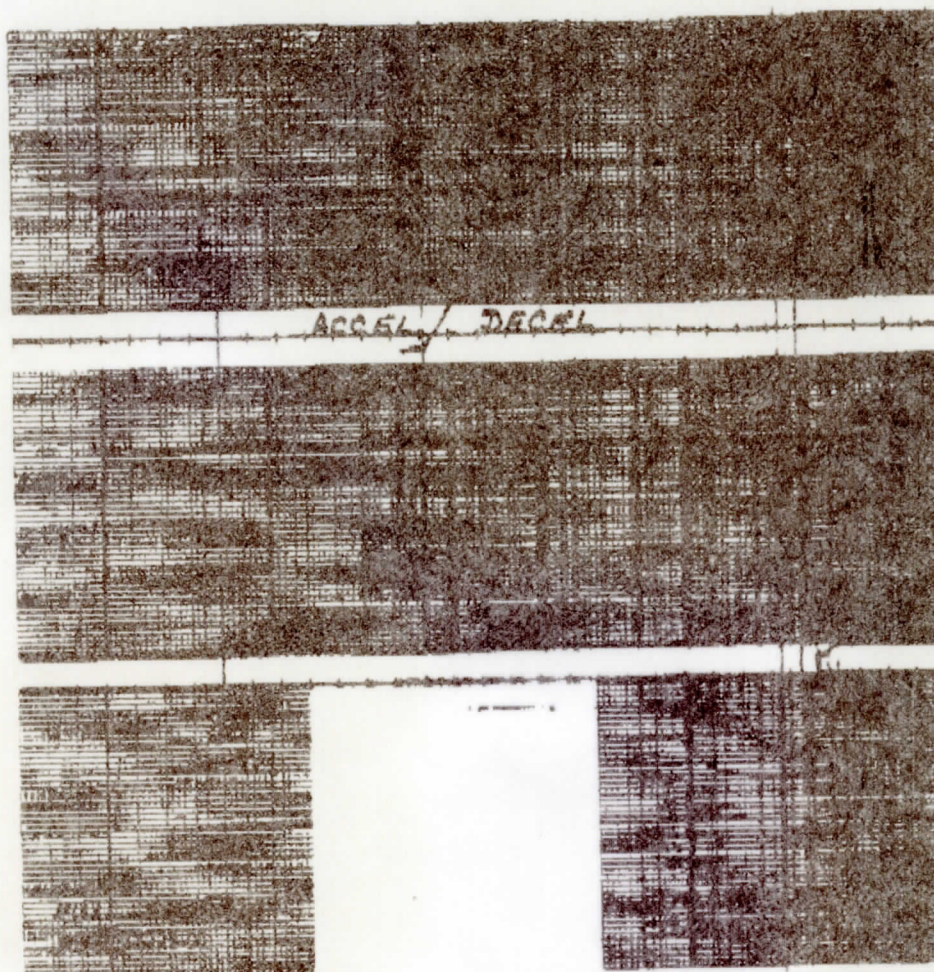
Sincerely,

Larry D. Pachacek
President & CEO

LDP/vm

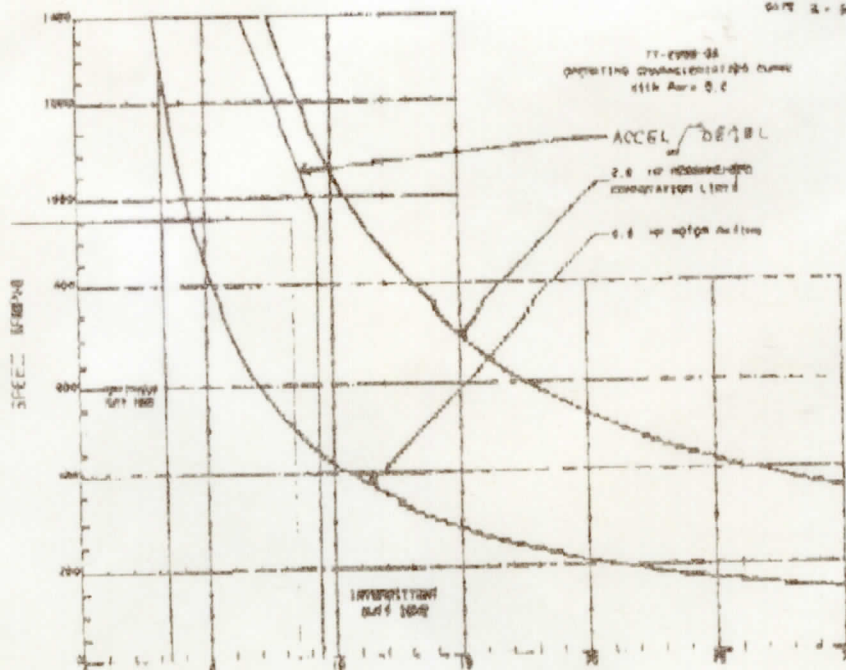
SED2-2935CA2/160-20

91 2 07 3



INDUSTRIAL SERVICE DIVISION WHITMORE CORPORATION

40-0000
10000-0
UNIVERSITY OF
GATE 2-4-40

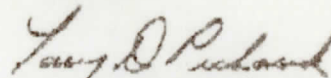


100 lbs = 2.33
0.1" radius TORQUE (LB FT)
= 11.3 lbs
in force
characteristics

1000 111 111

If you have any questions concerning this matter, please do not hesitate to contact me at (512) 227-5651. Even though all work must be considered outside the terms of the previous and contract BSI will work with you as much as possible to resolve these operational concerns.

Sincerely,



Larry D. Pechacek
President & CEO

LDP/vm
ATTACHMENT

CTROSPEC SYSTEMS, INC.



February 28, 1991

Henry Whitmore
Whitmore Enterprises
Route 5, Box 369
San Antonio, Tx 78221

Ref: NASA Contract NAS 918230, Item 8

Dear Mr. Whitmore:

There are two operational concerns with the current prototype configuration which should be discussed. The first is the inability of the servo motor and drive amplifier to maintain the required torque to work effectively above a sustained weight of 30 pounds. The second concern is the excessive amount of radiated electro-magnetic emissions from the servo amplifier and motor which renders the device inoperative if fully assembled.

The servo motor and drive amplifier were supplied by the contractor. These components were purchased from the Industrial Drive Division of Kollmorgen as a complementary set and the specifications data assumes both components as a single system. The ratio between the rope drum/sprocket diameter and motor drive socket diameter were chosen so that the ergometer speed and torque requirements fit optimally within the servo motor system operating envelope. Our operational testing demonstrates the servo motor system does not provide the torque indicated by its data sheets. A copy of the torque-speed curves for the servo system is attached to this letter. On this graph, I have penciled in the operating envelope requirement for the ergometer. It should be noted that all other ergometer components will meet these requirements. The recommended resolution of this deficiency is to replace the contractor supplied assemblies with equipment capable of supporting the requirements in high duty cycle operations.

The second operational concern is the excessive amount of radiated emissions from the contractor supplied assemblies. This radiated emissions causes electromagnetic interference (EMI) with the analog and digital device circuitry. With the prototype ergometer fully assembled, the EMI is pervasive enough to prevent proper operation of the device. However, device operation can be demonstrated if the inner panel and control panel are not mounted and placed to the side of the unit. This capability demonstrates the deleterious affect of the device mechanical packaging design upon the EMI. The recommended solution of this flaw is provide one enclosure for the motor and motor drive electronics and one enclosure for the device analog and digital control electronics. The two enclosures can be interconnected using small gauge twisted shielded cable assemblies. There are other solutions which might be tried in an effort to maintain the single package scheme if desired. The optimum choice for this case would be to replace the motor drive electronics with a design that exhibits much less radiated emissions. The unipolar pulse width modulation design used by the current motor drive electronics provides good power efficiency but is perhaps the worst design from an EMI standpoint.

ELECTROSPEC SYSTEMS, INC.



February 28, 1991

Henry Whitmore
Whitmore Enterprises
Route 5, Box 389
San Antonio, Tx 78221

Re: NASA Contract NAS 918230, Item 5

Dear Mr. Whitmore:

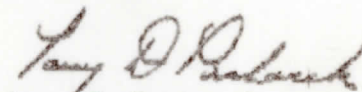
This letter accompanies the delivery of the prototype ergometer by Electrospec Systems, Inc. (ESI) to Whitmore Enterprises in support of NASA Contract NAS 918230, Item 5. All electrical and electronic design, assembly, and testing has been completed and all system software has been written, tested and is currently operational. ESI has thus completed all work as required under the current contract between ESI and Whitmore Enterprises. ESI will, however, meet with Whitmore Enterprises at a mutually agreed upon time to discuss the user operation instructions for the device.

Some work on the device has yet to be completed by Whitmore Enterprises. These include:

- o Completion of items to be accomplished and delineated in the ESI letter to Whitmore Enterprises dated February 14, 1991.
- o Provision of coupling between the servo motor and the displacement transducer that eliminates relative slippage between the assemblies during device operations. The coupling rework should be in such a way as to preserve the current drive ratio and relative rotation directions.

If you have any questions concerning this matter, please do not hesitate to contact me at (512) 227-5651. As we agreed in one of our telephone conversations today, ESI will retain the ergometer until further notice from Whitmore Enterprises.

Sincerely,


Larry D. Pechacek
President & CEO

LDP/vm

Sincerely,

Henry B. Whitmore, President
Whitmore Enterprises, Inc.

HBW/aww

Enclosure

After consulting with our sub-contractor, Electrospec Systems, Inc., we estimate an additional cost of \$6,800.00 above the current contract price for Item 5 (\$39,466.80) to bring the equipment up to specifications.

This cost estimate is broken down as follows: \$4,800.00 is budgeted for the manufacturer component upgrade and necessary electronic interface changes performed by Electrospec Systems, Inc.; and \$2,000.00 is estimated to cover the necessary hardware changes and re-design to accommodate the larger power supply and new circuit board to be performed by Whitmore Enterprises, Inc. The delivery of the upgrade components will take two to three months according to the manufacturer, plus an additional month for interfacing the components. 20

We are making the following recommendations:

- we can deliver the item if the specifications are changed to a lower force of approximately 50 pounds in the isotonic mode; or,
- with the approval of NASA, we can purchase the new components and do the additional work to upgrade the GFE so it will meet the 100 pound force required in the isotonic mode.

We are enclosing copies of letters from our sub-contractor estimating materials and explaining in more detail the problem and solution.

Our test proves this equipment with the current GFE can develop less than half the required torque. Our end results from testing showed we were achieving about 50 pounds force instead of the required 100 pounds.

When we received this GFE it was inoperable, as mentioned in the April 16, 1990 status report. At our expense we had one of the circuit boards repaired at a cost of \$318.50. In spite of this repair the GFE will not perform within the manufacturers' specifications.

We have talked with the manufacturer of this GFE and they recommend to replace the circuit boards with upgraded boards and power supply. They say that this upgrade will double the power output. By doubling the output the current 50 pound's force should more than double increase to 100 pound force meeting this specification requirement of 100 pounds.

The GFE was supplied as an integral component to the success of Item 5. After installation however, the GFE is not performing according to manufacturers' specifications, making the equipment unable to perform at the desired levels. This project was a research and development effort under a firm fixed price contract. We have accomplished the work required; however, if NASA desires, the existing GFE equipment can be upgraded to perform at manufacturers' specifications.

DRAFT

March 12, 1991

Contracting Officer
~~Contracting Officer~~ B241

Mrs. Helen R. Crawford B241(93)
NASA Lyndon B. Johnson Space Center
Data Systems & Aircraft Operations Procurement Office
Houston, Texas 77058

Reference: Item 5 (Prototype Ergometer), Contract NAS 9-18230

Dear *Mr. Johnson*;
~~Mrs. Crawford~~

We are in the final stage of testing Item 5 (Prototype Ergometer). We have encountered some problems controlling the excessive amount of radiated electromagnetic emissions from the GFE servo amplifier. We are physically relocating some of the circuit boards to isolate the electromagnetic emissions from these boards.

During this test we have determined the GFE furnished for this project will not develop the force required to meet our specifications in one of the modes of operations. While operating the equipment in the isotonic force mode, the system is supposed to develop up to 100 pounds force. The GFE torque capability should be 8.33 foot pounds (according to the manufacturer's specifications) in this mode. The unit should develop 107 pounds force with the gear ratio we are using. This would be within our design limits meeting the 100 pounds required in our contract specifications.

FAX MESSAGE

32785
W. Whitmore

DATE: MARCH 12, 1991
TO: HELON CRAWFORD/BG81(93) (Call 483-4159 for pick-up)
COMPANY: NASA/JSC
FAX NUMBER: (713) 483-6200
FROM: HENRY WHITMORE
FAX NUMBER: (512) 624-3289
SUBJECT: NAS 9-18230, ITEM 5
of pages (including this cover sheet): 13

MESSAGE:

HELON-

PER OUR TELEPHONE CONVERSATION, WE ARE FAXING
THIS DRAFT FOR YOUR APPROVAL

Received
at Contractors
Request

(If you do not receive all pages, please call back immediately.)

WHITMORE ENTERPRISES, INC.

Route 5, Box 369
San Antonio, Texas 78221
Phone (512) 624-2121

HENRY B. WHITMORE