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BEFORE THE

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Federal Communications Commission

FEB 21 1990

WASHINGTON, D.C. 20554

Domestic Facilities Division
Satellite Radio Branch

COPY

In the Matter of the)
Request of)
ARC Professional Services)
Group, Inc.)
For Special Temporary)
Authority to Operate a)
Communications Satellite)
Providing Domestic Fixed)
Satellite Service at 62° W.L.)

File No. 19-DSS-MISC-90

**REQUEST OF ARC PROFESSIONAL SERVICES GROUP, INC.
FOR SPECIAL TEMPORARY AUTHORITY TO PROVIDE
DOMESTIC SERVICE VIA TDRS-5 AT 62° W.L.**

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Date: January 29, 1990

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Satellite Service at 62° W.L.)

Directed to: Chief, Common Carrier Bureau

**REQUEST OF ARC PROFESSIONAL SERVICES GROUP, INC.
FOR SPECIAL TEMPORARY AUTHORITY TO PROVIDE
DOMESTIC SERVICE VIA TDRS-5 AT 62° W.L.**

Pursuant to Section 154(i) of the Communications Act of 1934, as amended, ARC Professional Services Group, Inc. ("ARC") hereby requests special temporary authority (an "STA") to operate the C-band transponders on the spacecraft TDRS-5 at 62° W.L. to provide fixed satellite service between points in the United States.

I. Introduction

NASA has developed a tracking and data relay satellite (TDRS) system to provide communications and data relay services between low earth-orbiting satellites and ground mission control and data-handling stations. The TDRS system operates on

government frequencies at S-band (2025-2300 MHz) and Ku-band (13,750-15,115 MHz).

The TDRS space segment is composed of three relay satellites in geostationary orbit. TDRS satellites located at 41° W.L. and 171° W.L. provide operational TDRS service. A third TDRS satellite, centrally positioned between the two spacecraft providing TDRS service, serves as an in-orbit spare for the TDRS system.

The TDRS satellites are designated by number (TDRS-1, TDRS-2, etc.). The numbering scheme for the TDRS satellites has recently been changed. The following table identifies each TDRS satellite by its current number, its former number, and its launch date and current location:

Table 1
TDRS SATELLITES

<u>New In-Flight (FCC) Number Designation for TDRS</u>	<u>Former In-flight (FCC) No.</u>	<u>Launch Date</u>	<u>Current Location</u>
1	1	April, 1983	Originally 41° W.L.; now at 79° W.L. as interim spare.
2	-	Jan., 1986	Lost with Challenger
3	2	Sept., 1988	171° W.L.
4	3	March, 1989	41° W.L.
5	4	(Jan., 1991)	62° W.L., replaces #1
6	5	(early 1990's)	171° W.L., to be co-located w/ TDRS #3
7	6	(early 1990's)	41° W.L., to be co-located w/ TDRS #4

Thus, TDRS-4 currently operates and provides TDRS service at 41° W.L. and TDRS-3 provides TDRS service from 171° W.L. TDRS-1, which was originally located at 41° W.L., has been relocated to 79° W.L. It serves as the current in-orbit spare for the TDRS system.

The next TDRS satellite to be launched will be TDRS-5. It is scheduled to be launched in January, 1991 and will be positioned at 62° W.L. At that time, TDRS-1 will be nearing the end of its useful life. TDRS-5 will replace TDRS-1 as the centrally positioned in-orbit spare satellite for the TDRS system.

In addition to operating on government frequencies to provide TDRS service, each of the TDRS satellites also contains twelve transponders which operate on commercial C-band frequencies (the 4/6 GHz band). Use of these C-band transponders for domestic service requires an authorization from the Federal Communications Commission ("FCC" or "Commission").

The purpose of ARC's instant request is to obtain an STA from the Commission which will permit ARC to use the C-band capacity on the TDRS-5 satellite at 62° W.L. to provide service to NASA. For the reasons presented hereafter, ARC is legally, financially, and technically qualified to receive an STA in this case, and it would be in the public interest for the Commission

to issue an STA to ARC.

II. Request for Temporary Authority

ARC is applying for special temporary authority to operate TDRS-5, a C-band satellite, on a non-common carrier basis to provide domestic fixed satellite service from 62° W.L.

ARC's address is:

ARC Professional Services Group, Inc.
585 Grove Street
Suite 300
Herndon, Virginia 22070

Inquiries and correspondence should be addressed to Mr. L. Roy Patterson at the above address, with a copy to Counsel for ARC:

James G. Ennis, Esquire
Fletcher, Heald & Hildreth
1225 Connecticut Ave, N.W., Suite 400
Washington, D.C. 20036
Telephone: (202) 828-5700

ARC will operate the C-band transponders on TDRS-5 as a private, non-common carrier. ARC's only customer will be NASA; ARC will not make the C-band transponder capacity available to the public generally. Thus, ARC will not be providing common

carrier services.

ARC will retain exclusive responsibility for the operation and control of the radio facilities with respect to the C-band transponders. ARC will have full operational control over the C-band transponders, including maintenance of transponder performance and authority to turn off any C-band transponder if necessary.

Space Communications Company (Spacecom), the company which owns the TDRS system and provides NASA with the S- and Ku- band TDRS services, will be responsible for adjusting the attitude and orbital position of the TDRS-5 satellite. However, ARC will monitor and test the C-band transponders through its own uplink, and will command and control the C-band transponders through an information link connecting the ARC operating center with Spacecom's T,T&C station in White Sands, New Mexico. ARC will be able to activate and deactivate the C-band transponders through the information link.

III. ARC is Legally Qualified to Receive an STA to Operate the C-Band Transponders on the TDRS Satellite at 62° W.L.

ARC is a domestic corporation organized under the laws of the State of Maryland. ARC is a wholly-owned subsidiary of

Atlantic Research Corporation, which is in turn a wholly-owned subsidiary of Sequa Corporation. Both Atlantic Research Corporation and Sequa Corporation are corporations organized under the laws of the State of Delaware. A copy of a current Form 430, "Common Carrier and Satellite Radio Licensee Qualification Report" for ARC is appended hereto as Appendix 1.

ARC's immediate predecessor-in-interest was a company named ORI, Inc. ("ORI"). ORI, like ARC, was a company wholly controlled by Atlantic Research Corporation. In turn, ORI's predecessor-in-interest was a company named Systematics General Corporation ("SGC"). It, too, was a wholly-owned subsidiary of Atlantic Research Corporation.

On numerous occasions in the past, the Commission has issued ORI and SGC special temporary authorizations ("STAs")^{1/} to provide domestic service to government agencies using the C-

^{1/} Section 154(i) provides the Commission with the legal basis for issuing an STA. Under Section 154(i) of the Communications Act, 47 U.S.C. §154(i), the Commission is empowered to "perform any and all acts . . . and issue such orders, not inconsistent with this chapter, as may be necessary in the execution of its functions." This extends to issuing STAs. See, e.g., KDAB, Inc., 91 F.C.C.2d 277, 52 R.R.2d 201, 207 (1982); Gale Broadcasting Co., Inc., 19 F.C.C.2d 623, 626 (1969). Since the 180 day limitation does not apply in the case of STAs authorized pursuant to Section 154(i), the requested STA can be issued until further order of the Commission, and hence does not need to be renewed every six months. See Systematics General Corporation, 2 FCC Rcd 7550, 7551 (1987).

band capacity on the TDRS satellites. Thus, in 1985, the Commission authorized SGC to apply for an STA to provide domestic service using the C-band transponders on TDRS-1 at 41° W.L.2/ Pursuant to this decision, SGC applied for, and received, an STA to test and verify the C-band transponders on TDRS-1 at 41° W.L.3/

Similarly, in 1987, in anticipation of the move of TDRS-1 from 41° W.L. to 62° W.L. and its replacement at 41° W.L. by TDRS-3 (now designated TDRS-4), the Commission issued ORI an STA to provide domestic service using TDRS-1 from 41° W.L. and from 62° W.L.4/ It also issued ORI an STA to provide domestic service using TDRS-3 (now TDRS-4) at 41° W.L.5/ Lastly, in August, 1987, the Common Carrier Bureau authorized SGC to apply for an STA to operate TDRS-3 (now TDRS-4) at 41° W.L. to provide

2/ Systematics General Corporation, 103 F.C.C.2d 879 (1985).

3/ Letter of James R. Keegan, Ref. No. 61330 (Nov. 19, 1985).

4/ Since receiving this STA authority, TDRS-1 has been relocated to 79° W.L., not 62° W.L., and plans to use its C-band capacity have been shelved in order to conserve fuel on the spacecraft in case it is needed for TDRS purposes.

5/ Systematics General Corporation, 2 FCC Rcd 7550 (1987). The Commission recently approved the transfer of the STA authorization for TDRS-4 at 41° W.L. from ORI to ARC. Letter of James R. Keegan, Ref. No. 61330 (October 23, 1989). NASA has recently decided to sell Intelsat the use of the C-band capacity on the TDRS-4 satellite at 41° W.L. to meet Intelsat's needs.

international service.6/

The reason the Commission has chosen to issue STAs to ARC's predecessors-in-interest rather than licenses is that the TDRS satellites contain only twelve C-band transponders each and therefore do not meet the frequency re-use requirements the Commission has established for domestic fixed satellite service satellites.7/ In issuing an STA instead of a regular license to cover the operation of the TDRS satellites, the Commission has indicated that the C-band transponders on the TDRS satellites may be used until another operator is prepared to occupy the orbital positions where the TDRS satellites are located with more efficient C-band satellites.8/

ARC's request for an STA to operate TDRS-5 at 62° W.L. follows the procedure previously established by the Commission for utilizing the capacity on the TDRS satellites and does not raise any new or novel issues.

6/ The Commission adopted a full frequency re-use requirement in its August, 1983 Reduced Orbital Spacing decision. See, In the Matter of Licensing of Space Stations in the Domestic Fixed Satellite Service and Related Revisions of Part 25 of the Rules and Regulations, in ___ F.C.C.2d ___, 54 R.R.2d 577 (1983).

7/ Systematics General Corporation, 2 FCC Rcd 5406 (1987).

8/ Systematics General Corporation, 103 F.C.C.2d 879, 882 (1985).

In connection with the operation of TDRS-5 at 62° W.L., a copy of the IFRB information called for by Section 25.202(c) of the Commission's Rules is appended hereto as Appendix 2. This information is also being submitted under separate cover to the Commission.

IV. ARC is Financially Qualified to Receive an STA to Operate the C-Band Transponders on the TDRS Satellite at 62° W.L.

ARC is financially qualified to provide the requested service, as is evidenced by the material attached hereto as Appendix 3.

V. ARC is Technically Qualified to Receive an STA to Operate the C-Band Transponders on the TDRS Satellite at 62° W.L.

ARC is technically qualified to provide the requested service, as is evidenced by the material attached hereto as Appendix 4.

VI. Grant of ARC's Request For an STA Would Serve the Public Interest, Convenience, and Necessity

Grant of ARC's application will serve the public interest, convenience, and necessity in several ways. First, issuance of

special temporary authority will allow efficient use of the C-band spectrum which is available and currently unused at 62° W.L. If the C-band transponders on TDRS-5 are not used, the available C-band spectrum at 62° W.L. will lie fallow for at least the near future. Allowing TDRS-5's C-band transponders to remain unused -- when beneficial use can be made of them without prejudice to anyone -- would run counter to the Commission's goal of efficient use of U.S. orbital and spectrum resources.

Second, issuance of special temporary authority will permit the capacity of an in-orbit satellite to be fully utilized. Regardless of whether or not the C-band transponders can be used, the TDRS-5 satellite will be launched to serve as an in-orbit spare for the tracking and data relay satellite network which operates on government frequencies in the Ku- and S-bands. However, as the Commission is well aware, the government has expended substantial public funds to build the C-band portion of the TDRS-5 space station. U.S. taxpayers have paid approximately \$35 million for the construction of the commercial capacity on TDRS-5.^{9/} If these transponders cannot be used, that expenditure will have been wasted.

^{9/} The commercial portions of the six TDRS satellites (not all of which have been fully constructed) cost approximately \$210.1 million, according to figures published in the FCC's decision in Western Union Telegraph Company, 86 F.C.C.2d 196, 203, ___ R.R.2d ___, ___ (1981). This corresponds to \$35 million per satellite.

Third, grant of ARC's request for an STA will permit ARC to provide NASA with a needed communications service. NASA intends to use the C-band transponders to meet its point-to-point data communications requirements.^{10/} NASA's requirements include a need for a domestic satellite communications system with secure command/control links such as the TDRS-5 satellite offers.

VII. Waiver Pursuant to Section 304 of the
Communications Act of 1934

Pursuant to Section 304 of the Communications Act of 1934, ARC Professional Services Group, Inc. waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests the grant of temporary operating authority in accordance with this application.

VIII. Conclusion

Special circumstances warrant temporary authorization so long as the Communications Act and the Commission's policies

^{10/} NASA has requested ARC to provide regular TDRS C-band service as early as possible after TDRS-5 is operational. Prior to and in preparation for providing such service, ARC must test and validate control procedures and command protocols and determine service characteristics.

are not adversely affected.^{11/} In granting temporary authorization, the Commission is primarily concerned with efficient resource utilization.^{12/} ARC submits that its request for special temporary authority is clearly warranted under Section 154(i) of the Communications Act because of the circumstances described above and the need to use public resources efficiently. Therefore, it requests temporary authority to operate the twelve C-band transponders on TDRS-5 at 62° W.L., beginning in January, 1991, in order to provide domestic fixed satellite service to NASA.

my/jge02(1)sgcl

^{11/} GTE Satellite Corporation, 90 F.C.C.2d 1009 (1983).

^{12/} Memorandum of Opinion, Order and Authorization, In the Matter of the Application of Satellite Business Systems for Temporary Use of the 101° W.L. Orbital Position by the SBS-4 Domestic Fixed Satellite, Mimeo No. 5207, File No. 170-DSS-MP/ML-84, released July 9, 1984, at para.4.

ARC Professional Services
Group, Inc.
Application for STA for
TDRS-5
January, 1990

APPENDIX 1

FCC Form 430
Common Carrier and Satellite Radio
Licensee Qualification Report

COMMON CARRIER AND SATELLITE RADIO LICENSEE QUALIFICATION REPORT

INSTRUCTIONS

- A. The "Filer" of this report is defined to include: (1) An applicant, where this report is submitted in connection with applications for common carrier and satellite radio authority as required for such applications; or (2) A licensee or permittee, where this report is required by the Commission's Rules to be submitted on an annual basis.
- B. Submit an original and one copy (sign original only) to the Federal Communications Commission, Washington, D.C. 20554. If more than one radio service is listed in item 6, submit an additional copy for each such additional service. If this report is being submitted in connection with an application for radio authority, attach it to that application.
- C. Do not submit a fee with this report.

<p>1. Business Name and Address (Number, Street, City, State and ZIP Code) of Filer's Principal Office: ARC Professional Services Group, Inc. 585 Grove Street, Suite 300 Herndon, Virginia 22070</p>	<p>2. (Area Code) Telephone Number (703) 834-5600</p> <p>3. If this report supercedes a previously filed report, specify its date: 8/21/89</p>
---	--

<p>4. Filer is (check one): <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input checked="" type="checkbox"/> Corporation <input type="checkbox"/> Other (Specify):</p>	<p>5. Under the laws of what State (or other jurisdiction) is the Filer organized? Maryland</p>
--	---

6. List the common carrier and satellite radio services in which Filer has applied or is a current licensee or permittee:

Domestic and International Satellite Services

7(a) Has the Filer or any party to this application had any FCC station license or permit revoked or had any application for permit, license or renewal denied by this Commission? Yes No
If "YES," attach as Exhibit I, a statement giving call sign and file number of license or permit revoked and relating circumstances.

(b) Has any court finally adjudged the Filer, or any person directly or indirectly controlling the Filer, guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement, or other means of unfair methods of competition? Yes No
If "YES," attach as Exhibit II a statement relating the facts.

(c) Has the Filer, or any party to this application, or any person directly or indirectly controlling the Filer ever been convicted of a felony by any state or Federal Court? Yes No
If "YES," attach as Exhibit III a statement relating the facts.

(d) Is the Filer, or any person directly or indirectly controlling the Filer, presently a party in any matter referred to in items 7(b) and 7(c)? Yes No
If "YES," attach as Exhibit IV a statement relating the facts.

8. Is the Filer, directly or indirectly, through stock ownership, contract or otherwise, currently interested in the ownership or control of any other radio stations licensed by this Commission? Yes No
If "YES" submit as Exhibit V, the name of each such licensee and the licensee's relation to the Filer.

~~If Filer is an individual (sole proprietorship) or partnership, answer the following and Item 11:~~

9(a) Full Legal Name and Residential Address (Number, Street, City, State and ZIP Code) of Individual or Partners:	(b) Is individual or each member of a partnership a citizen of the United States? <input type="checkbox"/> Yes <input type="checkbox"/> No
(c) Is individual or any member of a partnership a representative of an alien or of a foreign government? <input type="checkbox"/> Yes <input type="checkbox"/> No	

If Filer is a corporation, answer the following and Item 11:

10(a) Attach as Exhibit VI, the names, addresses, and citizenship of those stockholders owning of record and/or voting 10 percent or more of the Filer's voting stock and the percentages so held. In the case of fiduciary control, indicate the beneficiary(ies) or class of beneficiaries.

Attached as Exhibit VI

(b) List below, or attach in Exhibit VII, the names and addresses of the officers and directors of the Filer.

Attached as Exhibit VII

(c) Is the Filer directly or indirectly controlled by any other corporation? Yes No

If "YES," attach as Exhibit VIII a statement (including organizational diagrams where appropriate) which fully and completely identifies the nature and extent of control. Include the following: (1) the address and primary business of the controlling corporation and any intermediate subsidiaries; (2) the names, addresses, and citizenship of those stockholders holding 10 percent or more of the controlling corporation's voting stock; (3) the approximate percentage of total voting stock held by each such stockholder; and (4) the names and addresses of the president and directors of the controlling corporation.

(d) Is any officer or director of the Filer an alien? Yes No


(e) Is more than one-fifth of the capital stock of the Filer owned of record or voted by aliens or their representatives, or by a foreign government or representatives thereof, or by a corporation organized under the laws of a foreign country? Yes No

(f) Is the Filer directly or indirectly controlled: (1) by any other corporation of which any officer or more than one-fourth of the directors are aliens, or (2) by any foreign corporation or corporation of which more than one-fourth of the capital stock is owned or voted by aliens or their representatives, or by a foreign government or representatives thereof. Yes No

(g) If any answer to questions (d), (e) or (f) is "YES," attach as Exhibit IX a statement identifying the aliens or foreign entities, their nationality, their relationship to the Filer, and the percentage of stock they own or vote.

11. CERTIFICATION

This report constitutes a material part of any application which cross-references it, and all statements made in the attached exhibits are a material part hereof. The ownership information contained in this report does not constitute an application for, or Commission approval of, any transfer of control or assignment of radio facilities. The undersigned, individually and for the Filer, hereby certifies that the statements made herein are true, complete and correct to the best of Filer's knowledge and belief, and are made in good faith.

WILLFUL FALSE STATEMENTS MADE ON THIS APPLICATION ARE PUNISHABLE BY FINE AND IMPRISONMENT [U.S. Code, Title 18, Section 1001] AND/ OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION PERMIT [U.S. Code, Title 47, Section 312(a)(1)]	Date	Filer (Must correspond with that shown in Item 1).	Typed or Printed Name
	1/9/90	ARC Professional Services Group, Inc.	L. Roy Patterson
	Signature		Title Vice President
			

NOTICE TO INDIVIDUALS REQUIRED BY PRIVACY ACT OF 1974 AND THE PAPERWORK REDUCTION ACT OF 1980

The solicitation of personal information requested in this form is to determine if you are qualified to become or remain a licensee in a common carrier or satellite radio service pursuant to the Communications Act of 1934, as amended. No authorization can be granted unless all information requested is provided. Response is required to obtain the requested authorization or retain an authorization.

ARC Professional Services
Group, Inc.
FCC Form 430
Exhibit 1
January, 1990

Statement of
Circumstances Surrounding
Denial of Application

In August, 1985, the Commission dismissed applications filed by ARC Professional Services Group, Inc.'s predecessor in interest, Systematics General Corporation ("SGC"), for a permit to construct, launch, and operate SGC's applications because they did not meet the frequency re-use requirements it had adopted in 1983. However, the Commission stated it would permit SGC to operate the TDRS facilities pursuant to an STA. Sys-
tematics General Corp., 103 F.C.C.2d 879 (1985).

my/jge03exhibit

10(a)

ARC Professional Services Group, Inc. is a wholly-owned subsidiary of Atlantic Research Corporation which is a wholly-owned subsidiary of Sequa Corporation. Atlantic Research Corporation is a Corporation organized under the laws of the State of Delaware. Sequa Corporation is a Corporation organized under the laws of the State of Delaware.

Sequa Corporation has a Class A common stock, a Class B common stock, and a Preferred stock.

The Class A shares have one vote per share.
The Class B shares have ten votes per share.
The Preferred shares have one vote per share.

Mr. Norman E. Alexander, Chairman of the Board and Chief Executive Officer of Sequa Corporation, owns approximately 28% of the Class A common stock and 47% of the Class B common stock and, accordingly, has approximately 43% of the total voting stock of Sequa Corporation. He resides at 24 Morris Lane, Scarsdale, New York and is a United States citizen.

Paine Webber Incorporated holds more than 10% of the Sequa preferred shares but would only have less than 1% of the voting shares of Sequa Corporation.

Paine Webber's address is 1285 Avenue of the Americas, New York, New York 10020. Paine Webber is a corporation organized under the laws of the state of Delaware.

10(b)

The names and addresses of the members of ARC Professional Services Group, Inc. Board of Directors and Officers are as follows:

W. Gerald Hamm, President,
and Chairman of the Board
508 Council Court, NE
Vienna, VA 22180

William H. Borten, Director
10804 Balantre Lane
Potomac, MD 20854

Christopher W. Robertson, Director
6324 Youngs Branch Drive
Fairfax Station, VA 22039

Jon Cowell, Senior Vice President
and General Manager
13404 Haddonfield Lane
Darnestown, MD 20878

Edward T. Jones, Senior Vice President
and General Manager
3231-D Sutton Place, NW
Washington, DC 20016

Thomas H. Bell, Vice President
6716 Sage Court
Adamstown, MD 21710

Walter Bennett, Vice President
1628 Turnbull Road
Dayton, OH 45432

Edward D. Bjorn, Vice President
8647 Overlook Road
McLean, VA 22102

Barbara F. Biendl, Secretary
7810 Newington Woods Drive
Springfield, VA 22153

John E. Dodge, Vice President
3915 Rose Lane
Annandale, VA

James F. Farrell, Vice President
1427 Highland Drive
Silver Spring, MD 20910

Robert R. Featheringham, Vice President
11317 Freas Drive
Gaithersburg, MD 20875

Norbert Fraylick, Vice President
10408 Mercado Way
Gaithersburg, MD 20875

Cornelius Hensel, Senior Vice President
50 S. Van Dorn Street # D-314
Alexandria, VA 22304

Robert V. Lieg, Vice President, Treasurer
and Assistant Secretary
19100 Rhodes Way
Gaithersburg, MD 20879

Gill F. Livingston, Vice President
4046 Vacation Lane
Arlington, VA 22207

Larry D. Miller, Vice President
867 Clopper Road # T-4
Gaithersburg, MD 20878

L. Roy Patterson, Vice President
7 Sherwood Road
Annapolis, MD 21401

Ronald M. Proudfoot, Vice President
8012 Goodhurst Drive
Gaithersburg, MD 20879

Mitchell B. Rambler, Vice President
11005 Colonial Green Court
Gaithersburg, MD 20878

David L. Reed, Vice President
14649 Stonewall Drive
Silver Spring, MD 20904

P. Jennings Scarce, Vice President
909 Twin Oaks Drive
Rockville, MD 20852

John B. Stevens, Vice President
6315 Karmich Street
Fairfax Station, VA 22152

Anthony L. Ward, Vice President
7877 Heatherton Lane
Potomac, MD 20854

Earl W. Wells, Vice President
9024 Copenhaver Drive
Potomac, MD 20854

10(c) (1)

ARC Professional Services Group, Inc. is a wholly-owned subsidiary of Atlantic Research Corporation, which is a wholly-owned subsidiary of Sequa Corporation.

The corporate offices of Sequa Corporation are:

200 Park Avenue
New York, New York 10185

The primary business of Sequa Corporation is:

Sequa Corporation (formerly Sun Chemical Corporation), is a diversified company with principal interests in the fields of aerospace, military electronics and electro optics, specialty chemicals, machinery for container and printing markets and transportation.

The corporate offices of Atlantic Research Corporation are:

5390 Cherokee Avenue
Alexandria, Virginia 22312

The primary business of Atlantic Research Corporation is:

Atlantic Research Corporation is a high technology company that provides propulsion systems and products, professional and technical services, electronics and communications systems, TEMPEST services, and data communications test equipment and systems.

- Continued on next page -

10(c) (2) and
10(c) (3)

The names, address, and citizenship of those stockholders holding 10 percent or more of Sequa Corporation's voting stock, and the approximate percentage of total stock held by each such stockholder are:

Norman E. Alexander
Chairman of the Board and Chief Executive Officer of Sequa Corporation
24 Morris Lane
Scarsdale, NY 10583
U. S. Citizen
Owns 43% of Sequa Corporation's voting stock

10(c) (4)

The names and addresses of the president and directors of the controlling corporation are:

<u>Name</u>	<u>Business Address</u>	<u>Home Address</u>
Robert E. Davis President and Director	Sequa Corporation 200 Park Avenue New York, NY 10166	Ten Old Jackson Ave. Hastings on Hudson, NY 10708
Stuart Z. Krinsky Senior Executive Vice President & Director	Sequa Corporation 200 Park Avenue New York, NY 10166	1135 Greacen Point Road Mamaroneck, NY 10543
Alvin Dworman	ADCO Group 645 Fifth Avenue New York, NY 10022	155 East 76th Street New York, NY 10021
A. Leon Fergenson	Penn Central Corporation 245 Park Avenue New York, NY 10017	Seven Meadow Place Larchmont, NY 10538
Raymond Frankel	Technological Investors Management Corporation 630 Third Avenue New York NY 10017	211 Hammocks Road Larchmont, NY 10538
David S. Gottesman	First Manhattan Company 437 Madison Avenue New York, NY 10017	26 Island Drive Rye, NY 20589

- continued on next page -

10(c) (4)

<u>Name</u>	<u>Business Address</u>	<u>Home Address</u>
Donald Kummerfeld	Magazine Publishers Association 575 Lexington Avenue New York, NY 10022	40 Central Park South New York, NY 10019
Richard S. LeFrak	LeFrak Organization, Inc. 97-77 Queens Boulevard Forest Hills, NY 11374	857 Fifth Avenue New York, NY 10021
Fred R. Sullivan	Kidde, Inc. Park 80 West - Plaza Two Saddle Brook, NJ 07862	857 Fifth Avenue New York, NY 10021
Gerald Tsai, Jr.	Primerica Corporation 200 Park Avenue New York, NY 10166	910 Fifth Avenue New York, NY 10021

ARC Professional Services
Group, Inc.
Application for STA for
TDRS-5
January, 1990

APPENDIX 2

IFRB Advance Publication
and
Coordination Information for
TDRS-5 at 62° W.L.

INFORMATION SUPPLIED FOR ADVANCE PUBLICATION
FOR THE USASAT SATELLITE NETWORK

General Information

The Administration of the United States of America informs the Members of the I.T.U. of its intention to authorize the operation of the planned USASAT Satellite Network which is proposed to provide domestic telecommunications services.

Section B. General Characteristics to be Furnished for a Satellite Network

Item 1 Identity of the Satellite Network

USASAT

Item 2 Date of Bringing into Use

31 December 1992

Period of Validity

15 years

Item 3 Administration Submitting the Advance Information

United States of America

Federal Communications Commission
Washington, D.C. 20554

FEDCOMCOM
Washington, D.C.

Item 4 Orbital Information Relating to the Space Station

<u>Nominal Geographic Longitude:</u>	62 degrees West
<u>Longitudinal Tolerance:</u>	0.1 degrees
<u>Inclination Excursion:</u>	0.1 degrees
<u>Visible Arc:</u>	60 to 135 deg. West
<u>Service Arc:</u>	60 to 70 deg. West
<u>Difference:</u>	Shaped-beam pattern limits useful service arc.

Section C. Characteristics of the Satellite Network in the Earth-to-Space DirectionItem 1 Earth-to-Space Service Areas

The 48 contiguous states of the United States, Puerto Rico and the U.S. Virgin Islands.

Item 2 Class of Stations and Nature of Service

TC

Item 3 Frequency Range

5925 - 6425 MHz

Item 4 Power Characteristics of the Transmitted Wave Into The Transmit Antenna

a)

Antenna diameter m	Maximum spectral power density dB(W/Hz)	On-axis gain dB(i)	Total peak envelope power dB(W)	Notes
10	-36.0	54.0	27.0	(1)
10	-46.0	54.0	27.0	(2)
10	-48.6	54.0	-1.1	(3)
5	-38.2	48.0	15.9	(4)

Notes:

- (1) The necessary bandwidth of this emission is 36 MHz when modulated by the normal baseband signal and 2 MHz when modulated by a triangular energy dispersal waveform.
- (2) The necessary bandwidth of this emission is 30 MHz.
- (3) The necessary bandwidth of this emission is 100 kHz.
- (4) The necessary bandwidth of this emission is 500 kHz.

- b) Radiation pattern: CCIR Rec. 465-1.
- c) Peak envelope power delivered to the antenna for television carriers: 27.0 dB(W).
- d) Minimum carrier power delivered to the antenna for narrow-band carriers: -1.1 dB(W).

Item 5 Characteristics of the Space Station Receiving Antenna

- a) Gain contours: See Figure 1.
- c) Polarization: Linear vertical

Item 6 Noise Temperature of the Receiving Space Station

1750 Kelvin

Item 7 Necessary Bandwidth

For narrow-band carriers: 100 kHz.

Item 8 Modulation Characteristics

For television carriers, peak-to-peak frequency deviation is 2 MHz at a 30 Hz rate in the absence of video signals.

Section D. Characteristics of the Satellite Network in the Space-to-Earth Direction

Item 1 Space-to-Earth Service Area

The 48 contiguous states of the United States, Puerto Rico and the U.S. Virgin Islands.

Item 2 Class of Stations and Nature of Service

EC

Item 3 Frequency Range

3700 - 4200 MHz

Item 4 Power Characteristics of Transmission into the Antenna

- a) Maximum power spectral density: -56.5 dB(W/Hz)
 Total peak envelope power: 6.5 dB(W)
 Necessary bandwidth: 36 MHz

- b) Peak envelope power delivered to the antenna:
 Television carriers: 6.5 dB(W)
 Narrow-band carriers: -6 dB(W)

- c) Minimum carrier power delivered to the antenna for narrow-band carriers: -19 dB(W)

Item 5 Characteristics of the Space Station Transmitting Antenna

- a) Gain contours: See Figure 2.

- c) Polarization: Linear vertical.

Item 6 Characteristics of Receiving Earth Stations

a)

	Antenna gain [dB(i)]	TEQ (K)	GAMMA (dB)
Lowest Equivalent satellite link noise temperature (TEQ) and associated transmission gain (GAMMA)	51.0	140	-20.6
	40.0	128	-27.0
Highest ratio of transmission gain (GAMMA) to equivalent satellite link noise temperature (TEQ)	51.0	300	-10.0
	40.0	139	-21.0

b) Typical radiation pattern:

Antenna sidelobes conform to:

- for G = 51 dB(i): CCIR Rec. 465-1
- for G = 40 dB(i): $29 - 25 \log(\emptyset)$

Item 7 Necessary Bandwidth

For narrow-band carriers the necessary bandwidth is 100 kHz.

Item 8 Modulation Characteristics

For television carriers, peak-to-peak frequency deviation is 2 MHz at a 30 Hz rate in the absence of video signals.

62 W

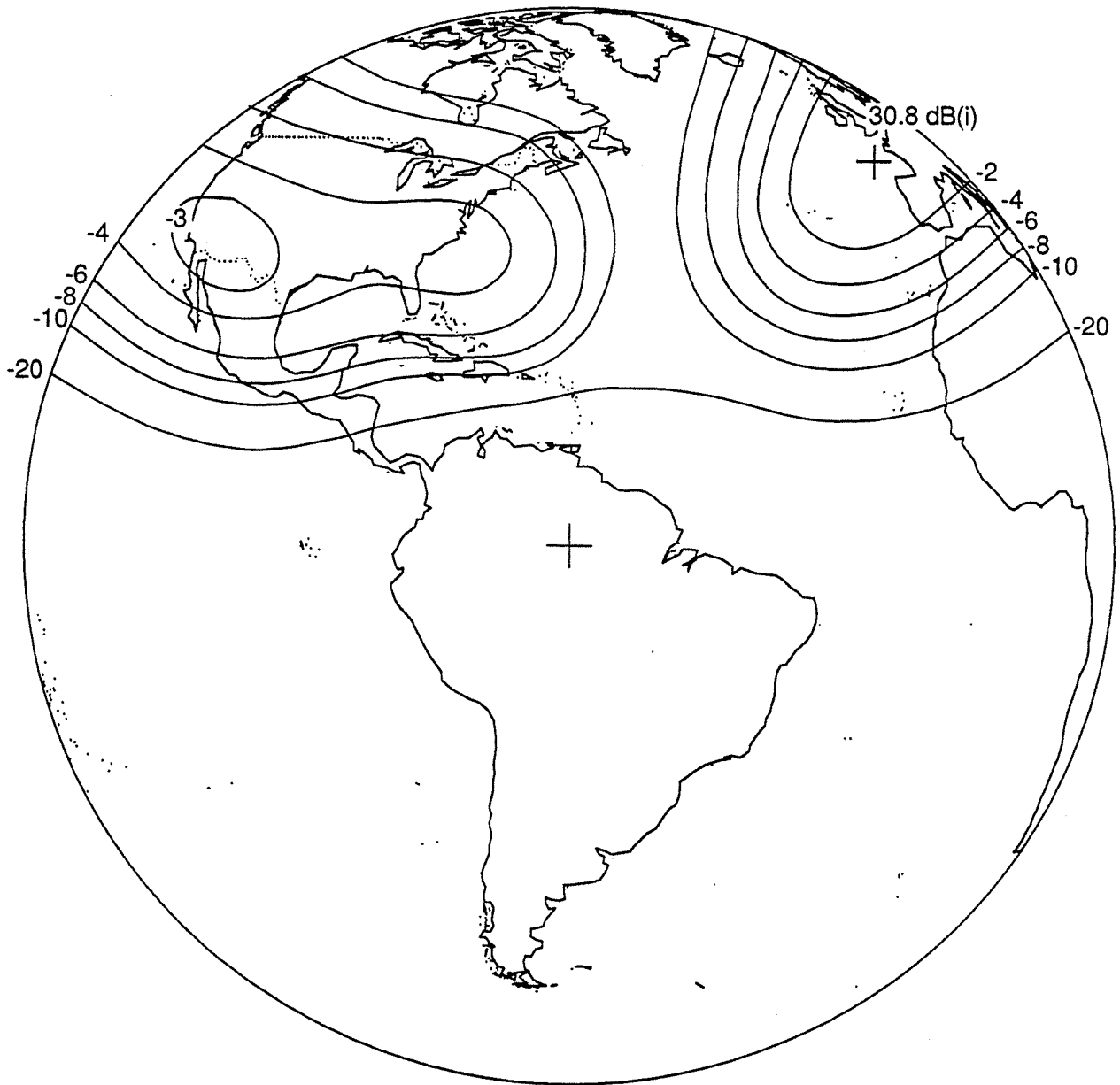


Figure 1 - Receive Gain Contours (62° W)

This Figure Includes Pointing Errors

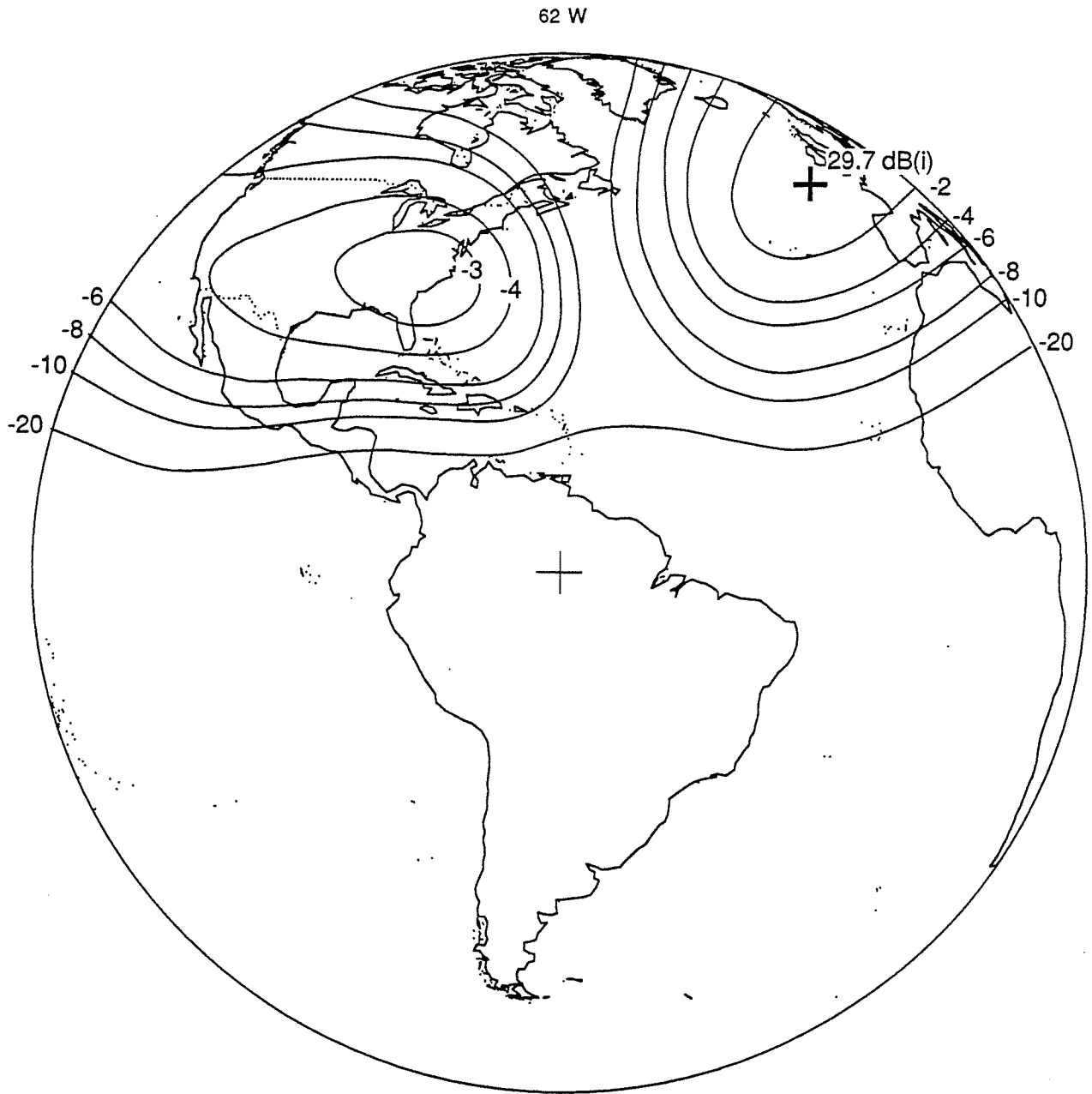


Figure 2 - Transmit Gain Contours (62° W)

This Figure Includes Pointing Errors

Page 1 of 4		Date	FORM OF NOTICE TRANSMITTING SPACE STATION (APPENDIX 3 - SECTION D)		(For IFRB use only)	AP3/D
A NOTIFYING ADMINISTRATION USA		B Administration Serial No.				
C First Notification <input type="checkbox"/> E1	RR 1488	E2	RR 1060	E3 Agreement under Art. 14	E4 Request for assistance by the Board for coord.	F Notification intended for ADD MOD SUP of an assignment
D Resubmission <input type="checkbox"/>	Notification <input type="checkbox"/>	Request for coordination <input checked="" type="checkbox"/>	RR 1611/1613	RR 1060	1) <input checked="" type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>	

CHARACTERISTICS OF THE ASSIGNMENT

1 - Assigned frequency K MHz	2 - Assigned frequency band 36000 kHz	7a - Class of station EC	7b - Nature of service	7c - Experm. station	3a - Date Col. 2c Day Mo. Year 31 12 92	12 - Reg. hours of oper. From (UTC) To (UTC) H Min. H Min. 00 00 24 00
STATION CHARACTERISTICS		For geostationary satellites only:		G Special Section AR/11/M/ (RR 1042)		
4a - Name of the transmitting space station or identity of the satellite network USASAT		4c - Designation of transmitting satellite beam NW		3b - Period of validity Years 15	10d - Pointing accuracy Degrees ± 0.3	H Special Section AR/11/C/ (RR 1060)

I TYPE OF THE SPACE STATION

Geostationary operating with: earth stations 1) , or another satellite 2) , and with simple frequency changing transponder 3)

or Non-geostationary operating with: earth stations 4) , or geostationary space station 5) , or another space station 6)

ORBITAL CHARACTERISTICS

FOR GEOSTATIONARY SATELLITES						Note: If the service arc (5a5) is less than the visibility arc (5a4), provide the reasons therefor in ATT. No. 4
5a1 - Nominal orbital longitude 62.0 W	5a2 - Longit. tolerance Degrees To West To East 0.1 0.1	5a3 - Inclinat. excursion Degrees 0.1	5a4 - Visibility arc Degrees From W To E 135 W 60 W	5a5 - Service arc Degrees From W To E 70 W 60 W		
FOR NON-GEOSTATIONARY SATELLITES						
5b1 - Inclinat. angle Degrees	5b2 - Period Days D Hours Hours H Min.	5b3 - Apogee km	5b4 - Perigee km	5b5 - Reference body, if other than the Earth	5b6 - Number of sats.	

AREA WHERE THE ASSOCIATED RECEIVING EARTH STATIONS ARE LOCATED OR ASSOCIATED RECEIVING SPACE STATION

6 - Designation, or fill in ATT. No. 7
see ATT. No. 7

CHARACTERISTICS OF ENTRIES PERTAINING TO THE ASSIGNMENT

ANTENNA CHARACTERISTICS

10 - maximum isotropic gain
± dB
+29.7

See also:
4c - Designation of transmitting satellite beam and ATTACHMENTS Nos. 1, 2 and 3, as appropriate

FCC 130-D
JANUARY 1982

CHARACTERISTICS SPECIFIC FOR EACH ENTRY

1) Entry No.	2) ADD	3) MOD	4) SUP	5a - Designation of emission	9b1 - Total peak power ± dBW	9b2 - Max. power density ± dBW/Hz
1				36M0F3F	+ 6.5	- 56.5
2				30M0G1D	+ 6.5	- 66.5
3				100KG1D	- 19.0	- 66.5

For additional entries use separate sheet

OTHER RELATED INFORMATION

13 - Coordination
- coordinated under RR 1060 or RR 1107 with:
- or coordination requested under RR 1060 with:

RR Provisions	Country symbols
RR 1060	USA/IT

14 - Agreements with respect to other provisions of the RR

RR Provisions	Country symbols
---------------	-----------------

ATTACHMENTS

K ATT No.	Item of AP3/D	Type of the space station	Description	Tick if included
1	10a	Geostat. operating with earth stations	Antenna gain contours	<input checked="" type="checkbox"/>
2	10b	Geostat. operating with another satellite	Radiation Pattern	
		Non-geostationary		
3	10c	Geostationary operating in frequency bands allocated in the Earth-to-space and space-to-Earth directions	Radiation diagram versus geostat. satellite orbit	
4	5a3	Geostationary operating with earth stations	Reasons for service arc < visibility arc	<input checked="" type="checkbox"/>
5	8b, c, d; 9a, c; 10c; 11	All types of space stations	Information used for coordination	
6	1	All types of space stations	List of assigned frequencies for assignments with all other characteristics identical	<input checked="" type="checkbox"/>
7	6	All types of space stations	Service area	<input checked="" type="checkbox"/>

OTHER INFORMATION OR REMARKS

L

*** 15a - ARC Professional Services Group, Inc**

If supplied on separate sheet(s), indicate the number

15a - Operating Administration or Company

15b - Administration responsible for the station

Page 2 of 4		Date	FORM OF NOTICE TRANSMITTING SPACE STATION (APPENDIX 3 - SECTION D)		(For IFRB use only)	AP3/D
A NOTIFYING ADMINISTRATION		B Administration Serial No.				
C First Notification <input type="checkbox"/>	E1 RR 1488	E2 RR 1060	E3 Agreement under Art. 14	E4 Request for assistance by the Board for coord.	F Notification intended for ADD MOD SUP of an assignment	
D Resubmission <input type="checkbox"/>	Notification <input type="checkbox"/>	Request for coordination <input type="checkbox"/>	RR 1611/1613 <input type="checkbox"/>	RR 1060 <input type="checkbox"/>	Identification No. of the assignment to be modified/deleted	

CHARACTERISTICS OF THE ASSIGNMENT

1 - Assigned frequency K M G Hz	2 - Assigned frequency band kHz	7a - Class of station	7b - Nature of service	7c - Ex- perm. station	3a - Date Col. 2c Day Mo. Year	12 - Reg. hours of oper. From (UTC) To (UTC) H Min. H Min.
STATION CHARACTERISTICS 4a - Name of the transmitting space station or identity of the satellite network For geostationary satellites only: 4c - Designation of transmitting satellite beam 3b - Period of visibility 10d - Pointing accuracy Degrees ±				G Special Section AR/11/A/ (RR 1042) H Special Section AR/11/C/ (RR 1060)		

I TYPE OF THE SPACE STATION

Geostationary operating with: earth stations 1) or another satellite 2) and with simple frequency changing transponder 3)

or Non-geostationary operating with: earth stations 4) or geostationary space station 5) or another space station 6)

ORBITAL CHARACTERISTICS

FOR GEOSTATIONARY SATELLITES						Note: If the service arc (5a5) is less than the visibility arc(5a4), provide the reasons therefor in ATT. No. 4
5a1 - Nominal orbital longitude	5a2 - Longitude tolerance Degrees To West To East	5a3 - Inclination excursion Degrees	5a4 - Visibility arc Degrees From W To E	5a5 - Service arc Degrees From W To E		
FOR NON-GEOSTATIONARY SATELLITES						
5b1 - Inclination angle Degrees	5b2 - Period Days 0 Hours Hours H Min.	5b3 - Apogee km	5b4 - Perigee km	5b5 - Reference body, if other than the Earth	5b6 - Number of sats.	

AREA WHERE THE ASSOCIATED RECEIVING EARTH STATIONS ARE LOCATED OR ASSOCIATED RECEIVING SPACE STATION

6 - Designation, or fill in ATT. No. 7

CHARACTERISTICS OF ENTRIES PERTAINING TO THE ASSIGNMENT

ANTENNA CHARACTERISTICS

10 - maximum isotropic gain
± dB

See also:
4c - Designation of transmitting satellite beam and ATTACHMENTS Nos. 1, 2 and 3, as appropriate

FCC 130-D
JANUARY 1982

CHARACTERISTICS SPECIFIC FOR EACH ENTRY

J	1) Entry No. 4	2) ADD	3) MOD	4) SUP	8a - Designation of emission 500KG1D	9b1 - Total peak power ± dBW - 6.0	9b2 - Max. power density ± dBW/Hz - 60.1
For additional entries use separate sheet							

OTHER RELATED INFORMATION

13 - Coordination - coordinated under RR 1060 or RR 1107 with: - or coordination requested under RR 1060 with:	
RR Provisions	Country symbols
14 - Agreements with respect to other provisions of the RR	
RR Provisions	Country symbols

OTHER INFORMATION OR REMARKS

L

If supplied on separate sheet(s), indicate the number

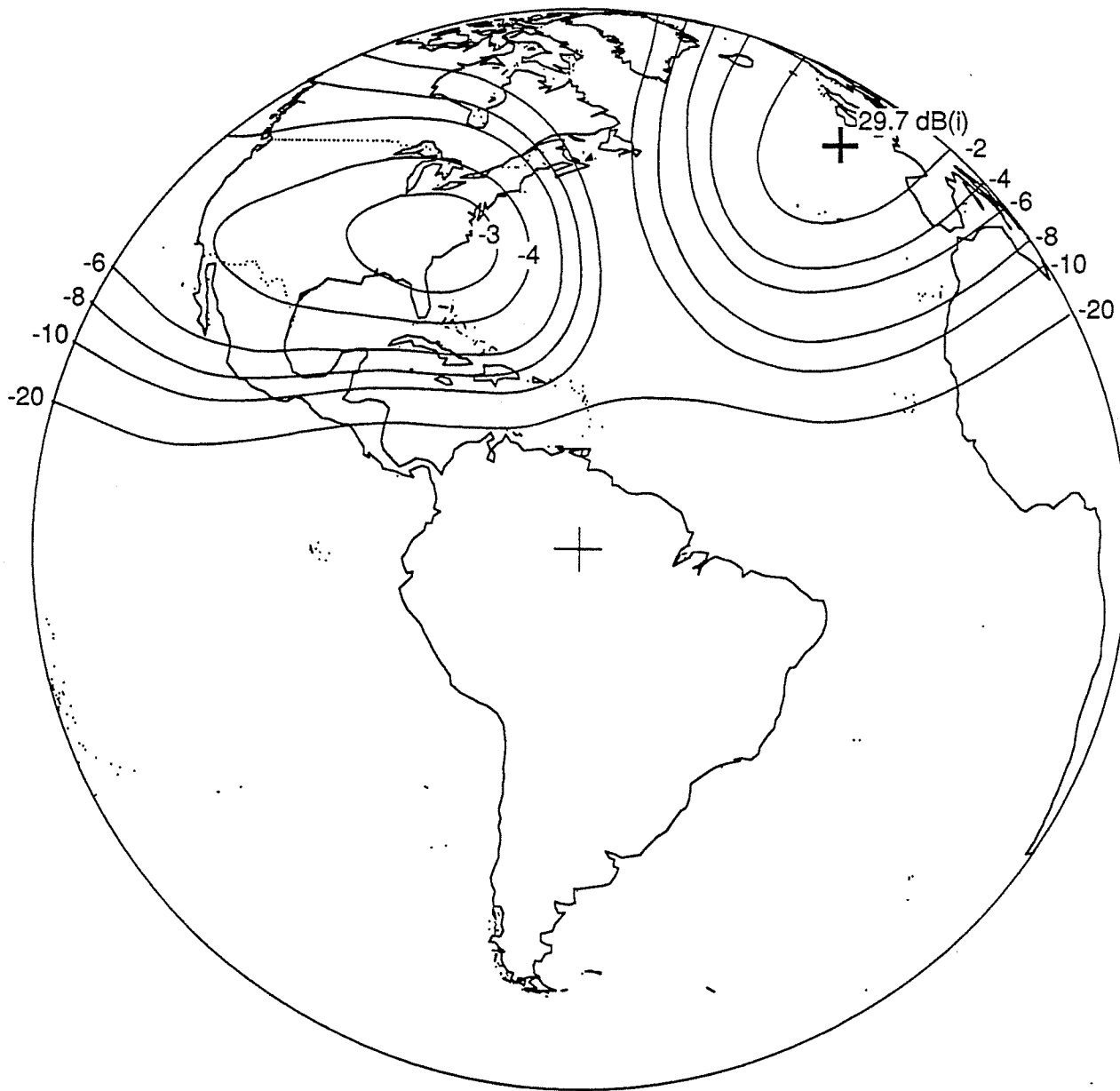
15a - Operating Administration or Company

15b - Administration responsible for the station

ATTACHMENTS

K	ATT No.	Item of AP3/D	Type of the space station	Description	Tick if included
	1	10a	Geostat. operating with earth stations	Antenna gain contours	
	2	10b	Geostat. operating with another satellite	Radiation Pattern	
			Non-geostationary		
	3	10e	Geostationary operating in frequency bands allocated in the Earth-to-space and space-to-Earth directions	Radiation diagram versus geostat. satellite orbit	
	4	5a3	Geostationary operating with earth stations	Reasons for service arc < visibility arc	
	5	8b, c, d; 9a, c; 10c; 11	All types of space stations	Information used for coordination	
	6	1	All types of space stations	List of assigned frequencies for assignments with all other characteristics identical	
	7	6	All types of space stations	Service area	

62 W



Attachment No. 1 to AP3/D
Transmit Gain Contours (62° W)
This Figure Includes Pointing Errors

18 July 1989

Page 4 of 4

ATTACHMENT No. 4 to AP3/D

Difference: Shaped beam pattern limits useful service arc.

ATTACHMENT No. 6 to AP3/D

List of assigned frequencies for assignments with all other characteristics identical:

3720 MHz
3760 MHz
3800 MHz
3840 MHz
3880 MHz
3920 MHz
3960 MHz
4000 MHz
4040 MHz
4080 MHz
4120 MHz
4160 MHz

ATTACHMENT No. 7 to AP3/D

Service area: The 48 contiguous states of the United States, Puerto Rico,
U.S. Virgin Islands.

Page 1 of 4		Date	FORM OF NOTICE RECEIVING SPACE STATION (APPENDIX 3 - SECTION E)		(For IFRB use only)	AP3/E
A NOTIFYING ADMINISTRATION USA		Administration Serial No.				
C First Notification <input type="checkbox"/> E1	RR 1488	E2 RR 1060	E3 Agreement under Art. 14	E4 Request for assistance by the Board for coord.	F Notification intended for ADD <input checked="" type="checkbox"/> MOD <input type="checkbox"/> SUP <input type="checkbox"/> of an assignment	
D Resubmission <input type="checkbox"/>	Notification <input type="checkbox"/>	Request for coordination <input checked="" type="checkbox"/>	RR 1611/1613	RR 1060	Identification No. of the assignment to be modified/delete	

CHARACTERISTICS OF THE ASSIGNMENT

1 - Assigned frequency K M G Hz	2 - Assigned frequency band kHz	7a - Class of station	7b - Nature of service	7c - Ex-perm. station	3a - Date Col. 2c Day Mo. Year	11 - Reg. hours of oper. From (UTC) To (UTC) H Min. H Min.
	36000	EC			31 12 92	00 00 24 00

STATION CHARACTERISTICS

4a - Name of the receiving space station or identity of the satellite network	4c - Designation of receiving satellite beam	3b - Period of validity Years	10d - Pointing accuracy Degrees	G Special Section AR/11/A (RR 1042)
USASAT	NW	15	0.3	158
				H Special Section AR/11/C (RR 1060)

TYPE OF THE SPACE STATION

Geostationary operating with: earth stations 1) or another satellite 2) and with simple frequency changing transponder 3)

or Non-geostationary operating with: earth stations 4) or geostationary space station 5) or another space station 6)

ORBITAL CHARACTERISTICS

FOR GEOSTATIONARY SATELLITES

5a1 - Nominal orbital longitude	5a2 - Longit. tolerance Degrees To West To East	5a3 - Inclinat. excursion Degrees	5a4 - Visibility arc Degrees From W To E	5a5 - Service arc Degrees From W To E	Note: If the service arc (5a5) is less than the visibility arc (5a4), provide the reasons therefor in ATT. No. 4
62.0 W	0.1 0.1	0.1	135 W 60 W	70 W 60 W	

FOR NON-GEOSTATIONARY SATELLITES

5b1 - Inclinat. angle Degrees	5b2 - Period Days D Hours H Min. Min.	5b3 - Apogee km	5b4 - Perigee km	5b5 - Reference body, if other than the Earth	5b6 - Number of sats.

AREA WHERE THE ASSOCIATED TRANSMITTING EARTH STATIONS ARE LOCATED OR ASSOCIATED TRANSMITTING SPACE STATION

6 - Designation, or fill in ATT. No. 7

see ATT. No. 7

CHARACTERISTICS OF ENTRIES PERTAINING TO THE ASSIGNMENT

ANTENNA CHARACTERISTICS

9a - maximum isotropic gain dB	See also: 4c - Designation of receiving satellite beam and ATTACHMENTS Nos. 1, 2 and 3, as appropriate	10 - Receiving system noise temperature Kelvin
+30.8		1750

FCC 130-E
JANUARY 1982

CHARACTERISTICS SPECIFIC FOR EACH ENTRY

1) Entry No.	2) ADD	3) MOD	4) SUP	8a - Designation of emission
1				36M0F3F
2				30M0G1D
3				100KG1D

For additional entries use separate sheet

OTHER RELATED INFORMATION

12 - Coordination
- coordinated under RR 1060 or RR 1107 with:
- or coordination requested under RR 1060 with:

RR Provisions	Country symbols
RR 1060	USA/IT

13 - Agreements with respect to other provisions of the RR

RR Provisions	Country symbols
---------------	-----------------

ATTACHMENTS

K	ATT No.	Item of AP3/E	Type of the space station	Description	Tick If Included
	1	9a	Geostat. operating with earth stations	Antenna gain contours	<input checked="" type="checkbox"/>
	2	9b	Geostat. operating with another satellite	Radiation Pattern	<input type="checkbox"/>
			Non-geostationary		
	3	9e	Geostationary operating in frequency bands allocated in the Earth-to-space and space-to-Earth directions	Radiation diagram versus geostat. satellite orbit	<input type="checkbox"/>
	4	5a3	Geostationary operating with earth stations	Reasons for service arc < visibility arc	<input checked="" type="checkbox"/>
	5	8b, c; 9c	All types of space stations	Information used for coordination	<input type="checkbox"/>
	6	1	All types of space stations	List of assigned frequencies for assignments with all other characteristics identical	<input checked="" type="checkbox"/>
	7	6	All types of space stations	Service area	<input checked="" type="checkbox"/>

OTHER INFORMATION OR REMARKS

L

* 14a - ARC Professional Services Group, Inc

If supplied on separate sheet(s), indicate the number

14a - Operating Administration or Company

14b - Administration responsible for the station

Page 2 of 4		Date	FORM OF NOTICE RECEIVING SPACE STATION (APPENDIX 3 - SECTION E)	(For IFRB use only)	AP3/E
A NOTIFYING ADMINISTRATION		B Administration Serial No.			
C First Notification <input type="checkbox"/>	E1 RR 1488	E2 RR 1060	E3 Agreement under Art. 14	E4 Request for assistance by the Board for coord.	F Notification intended for ADD <input type="checkbox"/> MOD <input type="checkbox"/> SUP <input type="checkbox"/> of an assignment
D Resubmission <input type="checkbox"/>	Notification <input type="checkbox"/>	Request for coordination <input type="checkbox"/>	RR 1611/1613 <input type="checkbox"/>	RR 1060 <input type="checkbox"/>	Identification No. of the assignment to be modified/deleted

CHARACTERISTICS OF THE ASSIGNMENT

1 - Assigned frequency K G Hz	2 - Assigned frequency band kHz	7a - Class of station	7b - Nature of service	7c - Ex. perm. station	3a - Date Col. 2c Day Mo. Year	11 - Reg. hours of oper. From (UTC) To (UTC) H Min. H Min.
STATION CHARACTERISTICS				G Special Section AR/11/A/ (RR 1042)		
4a - Name of the receiving space station or identity of the satellite network		4c - Designation of receiving satellite beam		3b - Period of validity Years	10d - Pointing accuracy Degrees	
				H Special Section AR/11/C/ (RR 1060)		

I TYPE OF THE SPACE STATION

Geostationary operating with: earth stations 1) or another satellite 2) and with simple frequency changing transponder 3)

or Non-geostationary operating with: earth stations 4) or geostationary space station 5) or another space station 6)

ORBITAL CHARACTERISTICS

FOR GEOSTATIONARY SATELLITES						Note: If the service arc (5a5) is less than the visibility arc(5a4), provide the reasons therefor in ATT. No. 4
5a1 - Nominal orbital longitude W	5a2 - Longit. tolerance Degrees To West To East	5a3 - Inclinat. excursion Degrees	5a4 - Visibility arc Degrees From W To E W	5a5 - Service arc Degrees From W To E W		
FOR NON-GEOSTATIONARY SATELLITES						
5b1 - Inclinat. angle Degrees	5b2 - Period Days D Hours Hours H Min.	5b3 - Apogee km	5b4 - Perigee km	5b5 - Reference body, if other than the Earth	5b6 - Number of sats.	

6 - Designation, or fill in ATT. No. 7

CHARACTERISTICS OF ENTRIES PERTAINING TO THE ASSIGNMENT

ANTENNA CHARACTERISTICS		10 - Receiving system noise temperature Kelvin
9a - maximum isotropic gain ± dB	4c - Designation of receiving satellite beam and ATTACHMENTS Nos. 1, 2 and 3, as appropriate	

FCC 130-E
JANUARY 1982

CHARACTERISTICS SPECIFIC FOR EACH ENTRY

J	1) Entry No.	2) ADD	3) MOD	4) SUP	8a - Designation of emission 500KG1D
For additional entries use separate sheet					

ATTACHMENTS

ATT No.	Item of AP3/E	Type of the space station	Description	Tick If Included
1	9a	Geostat. operating with earth stations	Antenna gain contours	
2	9b	Geostat. operating with another satellite	Radiation Pattern	
		Non-geostationary		
3	9c	Geostationary operating in frequency bands allocated in the Earth-to-space and space-to-Earth directions	Radiation diagram versus geostat. satellite orbit	
4	5a3	Geostationary operating with earth stations	Reasons for service arc < visibility arc	
5	Bb, c; 9c	All types of space stations	Information used for coordination	
6	1	All types of space stations	List of assigned frequencies for assignments with all other characteristics identical	
7	6	All types of space stations	Service area	

OTHER RELATED INFORMATION

12 - Coordination - coordinated under RR 1060 or RR 1107 with: - or coordination requested under RR 1060 with:	
RR Provisions	Country symbols
13 - Agreements with respect to other provisions of the RR	
RR Provisions	Country symbols

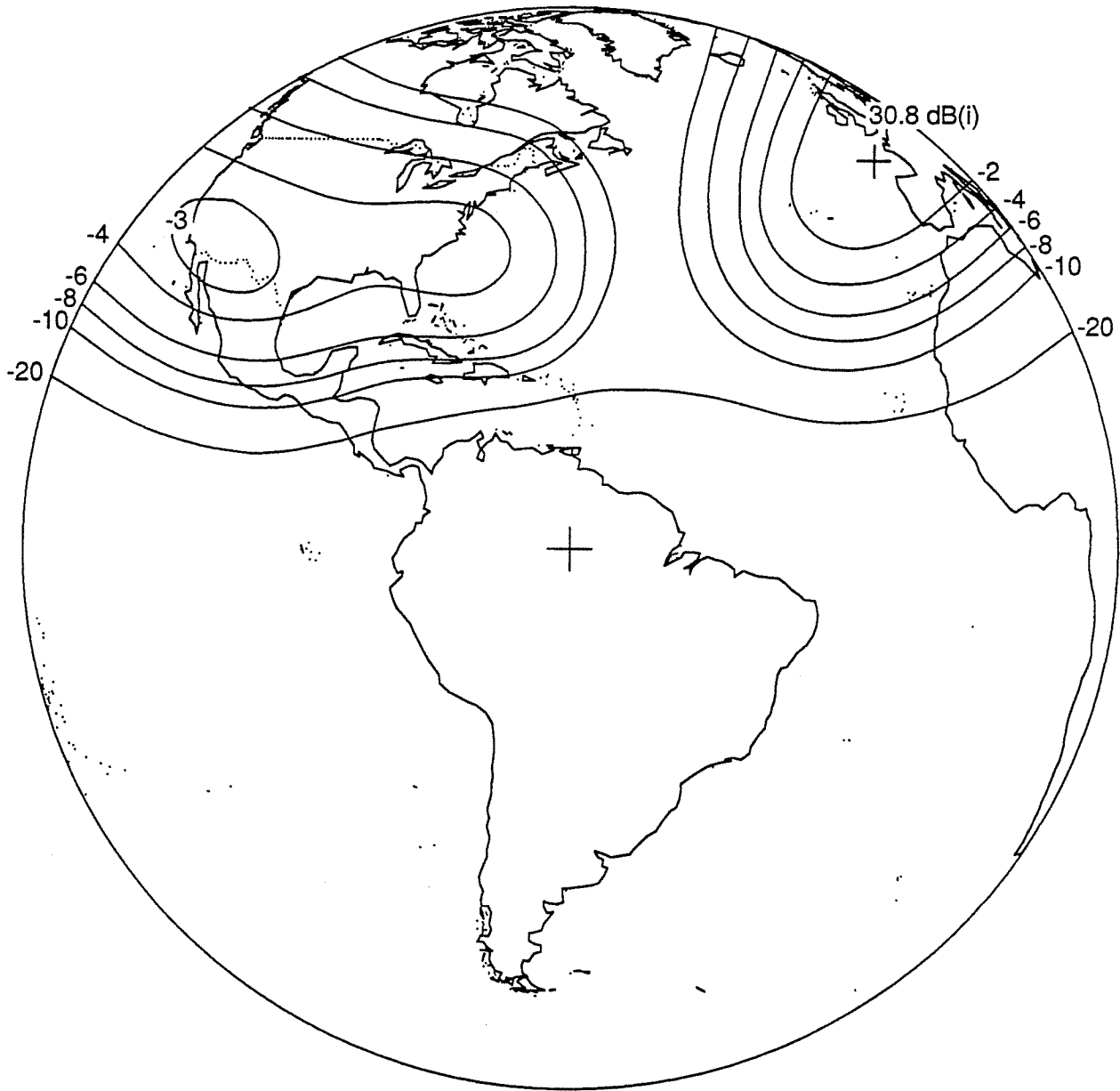
OTHER INFORMATION OR REMARKS

L

If supplied on separate sheet(s), indicate the number

14a - Operating Administration or Company	14b - Administration responsible for the station
--	---

62 W



Attachment No. 1 to AP3/E
Receive Gain Contours (62° W)
This Figure Includes Pointing Errors

18 July 1989

Page 4 of 4

ATTACHMENT No. 4 to AP3/E

Difference: Shaped beam pattern limits useful service arc.

ATTACHMENT No. 6 to AP3/E

List of assigned frequencies for assignments with all other characteristics identical:

5945 MHz
5985 MHz
6025 MHz
6065 MHz
6105 MHz
6145 MHz
6185 MHz
6225 MHz
6265 MHz
6305 MHz
6345 MHz
6385 MHz

ATTACHMENT No. 7 to AP3/E

Service area: The 48 contiguous states of the United States, Puerto Rico,
U.S. Virgin Islands.

Page 1 of 2	Date	FORM OF NOTICE TRANSMITTING EARTH STATION (APPENDIX 3 - SECTION B)	(For IFRB use only)
A NOTIFYING ADMINISTRATION USA		B Administration Serial No.	
C First Notification <input type="checkbox"/>	E1 RR 1488	E2 RR 1494	E3 RR 1060
D Resubmission <input type="checkbox"/>	Notification <input type="checkbox"/>	Notification typical mobile earth station <input type="checkbox"/>	Request for coordination <input checked="" type="checkbox"/>
E4 Agreement under Art 14 <input type="checkbox"/>		Request for Board assistance <input type="checkbox"/>	
E5 RR 1060		E6 RR 1107	
E7 RR 1611		E8 RR 1107	
E Notification intended for ADD MOD SUP of an assignment			Identification No. of the assignment to be modified/cancelled

CHARACTERISTICS OF THE ASSIGNMENT

1 - Assigned frequency * Hz	2 - Assigned frequency band 36000 kHz	6a - Class of station TC	6b - Nature of service	6c - Experm. station	3a - Date Col. 2c Day Mo. Year 31 12 92	11 - Req. hours of oper. From (UTC) To (UTC) H Min. H Min. 00 00 24 00	
STATION CHARACTERISTICS				4c - Geographical coordinates		G Special Section AR/11/A/ (RR 1042)	
4a - Name of the transmitting earth station T1-10 METER		4b - Country **		Longitude Degrees $\frac{1}{2}$ Min. Sec. Deg. $\frac{1}{2}$ Min. Sec.		H Special Section AR/11/C/ (RR 1060)	
						158	

ASSOCIATED SPACE STATION

FOR ALL TYPES OF SPACE STATIONS: 5a - Name of the receiving space station or identity of the satellite network USASAT	FOR GEOSTATIONARY SATELLITES ONLY: 5b - Nom. orbit long. Degrees $\frac{1}{2}$ Min. Sec. 62 0 W	5c - Designation of receiving satellite beam NW	Fill in a separate form for each satellite beam used by the earth station.
--	--	---	--

CHARACTERISTICS OF ENTRIES PERTAINING TO THE ASSIGNMENT

9a - maximum isotropic gain \pm dB +54 0	9b - Beamwidth Degrees 0 33	9e - Elevat. angle Degrees	9f - Operating azimuthal angles From (Degrees) To (Degrees)	9c - Radiation pattern: give Reference pattern, or M in ATT. No. 2 CCIR 465-1	9h - Altitude Metres	Note: For horizon elevation diagram (9d) M in ATT. No. 1
---	--	-------------------------------	--	--	-------------------------	---

CHARACTERISTICS SPECIFIC FOR EACH ENTRY

1) Entry No.	2) ADD	3) MOD	4) SUP	7a - Designation of emission	8b1 - Total peak power \pm dBW	8b2 - Max. power density \pm dBW/Hz
1				36M0F3F	+27 0	-36 0
2				30M0G1D	+27 0	-46 0
3				100KG1D	-1 1	-48 6

For additional entries use separate sheet

OTHER RELATED INFORMATION

12 - Coordination - coordinated under RR 1060 or RR 1107 with: - or coordination requested under RR 1060 with:	
RR Provisions	Country symbols
RR 1060	USA/IT
13 - Agreements with respect to other provisions of the RR	
RR Provisions	Country symbols

ATTACHMENTS

K	ATT No.	Item of AP3/B	Description	Tick if included
	1	9d	Horizon elevation diagram	
	2	9c	Antenna radiation diagram	
	3	7b,c,d; 8 a,c; 9g; 10	Information used for coordination	
	4	-	List of assigned frequencies for assignments with all other characteristics identical	<input checked="" type="checkbox"/>

OTHER INFORMATION OR REMARKS

*** 14a - ARC Professional Services Group, Inc**
**** 4b - USA, PTR & VIR**

If supplied on separate sheet(s), indicate the number

14a - Operating Administration or Company *****

14b - Administration responsible for the station **A**

18 July 1989

Page 2 of 2

ATTACHMENT No. 4 to AP3/B

List of assigned frequencies for assignments with all other characteristics identical:

5945 MHz
5985 MHz
6025 MHz
6065 MHz
6105 MHz
6145 MHz
6185 MHz
6225 MHz
6265 MHz
6305 MHz
6345 MHz
6385 MHz

Page 1 of 2		Date	FORM OF NOTICE TRANSMITTING EARTH STATION (APPENDIX 3 - SECTION B)		(For IFRB use only)	AP3/B
A NOTIFYING ADMINISTRATION USA		B Administration Serial No.				
C First Notification <input type="checkbox"/>	E1 RR 1488	E2 RR 1494	E3 RR 1060	E4 Agreement under Art. 14	E5 Request for Board assistance RR 1060 and/or	F Notification intended for ADD MOD SUP of an assignment
D Resubmission <input type="checkbox"/>	Notification <input type="checkbox"/>	Notification typical mobile earth station <input type="checkbox"/>	Request for coordination <input checked="" type="checkbox"/>	RR 1611 <input type="checkbox"/>	E6 RR 1107 <input type="checkbox"/>	Identification No. of the assignment to be modified/terminated

CHARACTERISTICS OF THE ASSIGNMENT

1 - Assigned frequency		2 - Assigned frequency band	6a - Class of station	6b - Nature of service	6c - Experm. station	3a - Date Col. 2c	11 - Reg. hours of oper.
Hz		36000 kHz	TC			Day Mo. Year	From (UTC) To (UTC)
						31 12 92	H Min. H Min.
							00 00 24 00
4a - Name of the transmitting earth station		4b - Country	4c - Geographical coordinates		g - Special Section AR/11/A/ (RR 1042)		
T2-5 METER		**	Longitude		158		
			Latitude		h - Special Section AR/11/C/ (RR 1060)		
			Degrees Min. Sec. Deg. Min. Sec.				

ASSOCIATED SPACE STATION

FOR ALL TYPES OF SPACE STATIONS:		FOR GEOSTATIONARY SATELLITES ONLY:	
5a - Name of the receiving space station or identity of the satellite network		5b - Nom. orbit long.	5c - Designation of receiving satellite beam
USASAT		Degrees	NW
		62 0 W	

Fill in a separate form for each satellite beam used by the earth station.

CHARACTERISTICS OF ENTRIES PERTAINING TO THE ASSIGNMENT

9a - maximum isotropic gain	9b - Beamwidth	9c - Elevat. angle	9f - Operating azimuthal angles	9c - Radiation pattern: give Reference pattern, or # in ATT. No. 2	9h - Altitude	Note:
dB	Degrees	Degrees	From (Degrees) To (Degrees)		Metres	For horizon elevation diagram (9d) # in ATT. No. 1
+48.0	0.65			CCIR 465-1		

CHARACTERISTICS SPECIFIC FOR EACH ENTRY

1) Entry No.	2) ADD	3) MOD	4) SUP	7a - Designation of emission	8b1 - Total peak power	8b2 - Max. power density
1				500KG1D	dBW	dBW/Hz
					+15.9	-38.2

For additional entries use separate sheet

OTHER RELATED INFORMATION

12 - Coordination	
- coordinated under RR 1060 or RR 1107 with:	
- or coordination requested under RR 1060 with:	
RR Provisions	Country symbols
RR 1060	USA/IT
13 - Agreements with respect to other provisions of the RR	
RR Provisions	Country symbols

ATTACHMENTS

ATT No.	Item of AP3/B	Description	Tick if included
1	9d	Horizon elevation diagram	
2	9c	Antenna radiation diagram	
3	7b,c,d; 8 a,c; 9g; 10	Information used for coordination	
4	-	List of assigned frequencies for assignments with all other characteristics identical	X

OTHER INFORMATION OR REMARKS

<p style="text-align: center; font-weight: bold;">* 14a - ARC Professional Services Group, Inc</p> <p style="text-align: center; font-weight: bold;">** 4b - USA, PTR & VIR</p> <p style="text-align: right; font-size: 8pt;">If supplied on separate sheet(s), indicate the number</p>

14a - Operating Administration or Company

14b - Administration responsible for the station

18 July 1989

Page 2 of 2

ATTACHMENT No. 4 to AP3/B

List of assigned frequencies for assignments with all other characteristics identical:

5945 MHz
5985 MHz
6025 MHz
6065 MHz
6105 MHz
6145 MHz
6185 MHz
6225 MHz
6265 MHz
6305 MHz
6345 MHz
6385 MHz

Page 1 of 2		Date	FORM OF NOTICE RECEIVING EARTH STATION (APPENDIX 3 - SECTION C)			(For IFRB use only)	AP3/C	
A NOTIFYING ADMINISTRATION USA		B Administration Serial No.						
C First Notification <input type="checkbox"/>	E1 RR 1488	E2 RR 1494 <small>Notification typical mobile earth station</small>	E3 RR 1060 <small>Request for coordination</small>	E4 Agreement under Art. 14 <input type="checkbox"/>	E5 RR 1060 <small>Request for Board assistance</small>	E6 RR 1107 <small>and/or</small>	F Notification intended for ADD <input checked="" type="checkbox"/> MOD <input type="checkbox"/> SUP <input type="checkbox"/> of an assignment	
D Resubmission <input type="checkbox"/>	Notification <input type="checkbox"/>		<input checked="" type="checkbox"/>	RR 1611 <input type="checkbox"/>	Identification No. of the assignment to be modified/deleted			

CHARACTERISTICS OF THE ASSIGNMENT

1 - Assigned frequency 36000 kHz	2 - Assigned frequency band 36000 kHz	6a - Class of station TC	6b - Nature of service	6c - Ex-penn. station	3a - Date Col. 2c Day 31 Mo. 12 Year 92	10 - Req. hours of oper. From (UTC) To (UTC) H Min. H Min. 0000 2400
STATION CHARACTERISTICS				4c - Geographical coordinates		G Special Section AR/11/A/ (RR 1042) 158
4a - Name of the receiving earth station T1-10 METER		4b - Country **	Longitude Degrees 5 Min. 1 Sec. 0		Latitude Degrees 2 Min. 1 Sec. 0	
				H Special Section AR/11/C/ (RR 1060)		

ASSOCIATED SPACE STATION

FOR ALL TYPES OF SPACE STATIONS: 5a - Name of the transmitting space station or identity of the satellite network USASAT		FOR GEOSTATIONARY SATELLITES ONLY: 5b - Nom. orbit long. Degrees 62 Min. 0 W		5c - Designation of transmitting satellite beam NW	Fill in a separate form for each satellite beam used by the earth station
---	--	--	--	--	---

CHARACTERISTICS OF ENTRIES PERTAINING TO THE ASSIGNMENT

8a - maximum isotropic gain +51.0 dB	8b - Beamwidth 0.46 Degrees	8e - Elevat. angle 0 Degrees	8f - Operating azimuthal angles From (Degrees) To (Degrees)	8c - Radiation pattern: give Reference pattern, or fill in ATT. No. 2 CCIR 465-1	8g - Altitude Metres	8d - Receiving system noise temperature Kelvin 125	Note: For horizon elevation diagram (8d) fill in ATT. No. 1
--	---------------------------------------	--	--	---	-------------------------	---	--

CHARACTERISTICS SPECIFIC FOR EACH ENTRY

1) Entry No.	2) ADD <input type="checkbox"/>	3) MOD <input type="checkbox"/>	4) SUP <input type="checkbox"/>	7a - Designation of emission 36M0F3F	9b - Satellite link noise temperature Kelvin 141	9c - Transmission gain \pm dB -20.5
1				30M0G1D	141	-20.5
2				100KG1D	140	-20.6
3						

For additional entries use separate sheet

9b - 9c only for geostationary space stations with simple frequency changing transponder.

OTHER RELATED INFORMATION

11 - Coordination - coordinated under RR 1060 or RR 1107 with: - or coordination requested under RR 1060 with:	
RR Provisions RR 1060	Country symbols USA/IT
12 - Agreements with respect to other provisions of the RR	
RR Provisions	Country symbols

ATTACHMENTS

ATT No.	Item of AP3/C	Description	Tick if included
1	8d	Horizon elevation diagram	
2	8c	Antenna radiation diagram	
3	7b, c; 8h	Information used for coordination	
4	-	List of assigned frequencies for assignments with all other characteristics identical	X

OTHER INFORMATION OR REMARKS

<p>* 13a - ARC Professional Services Group, Inc</p> <p>** 4b - USA, PTR & VIR</p> <p style="text-align: right; font-size: 8pt;">If supplied on separate sheet(s), indicate the number</p>

13a - Operating Administration or Company *	13b - Administration responsible for the station A
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12 July 1989

Page 2 of 2

ATTACHMENT No. 4 to AP3/C

List of assigned frequencies for assignments with all other characteristics identical:

3720 MHz
3760 MHz
3800 MHz
3840 MHz
3880 MHz
3920 MHz
3960 MHz
4000 MHz
4040 MHz
4080 MHz
4120 MHz
4160 MHz

Page 1 of 2		Date	FORM OF NOTICE RECEIVING EARTH STATION (APPENDIX 3 - SECTION C)		(For IFRB use only)	AP3/C
A NOTIFYING ADMINISTRATION USA		B Administration Serial No.				
C First Notification <input type="checkbox"/> E1	RR 1488	E2 RR 1494 Notification typical mobile earth station <input type="checkbox"/>	E3 RR 1060 Request for coordination <input checked="" type="checkbox"/>	E4 Agreement under Art. 14 RR 1611 <input type="checkbox"/>	Request for Board assistance E5 RR 1060 and/or E6 RR 1107 <input type="checkbox"/>	
D Resubmission <input type="checkbox"/>	Notification <input type="checkbox"/>				F Notification intended for ADD MOD SUP of an assignment Identification No of the assignment to be modified/deleted 1) <input checked="" type="checkbox"/> 2) <input type="checkbox"/> 3) <input type="checkbox"/>	

CHARACTERISTICS OF THE ASSIGNMENT

1 - Assigned frequency K M G Hz * <input type="checkbox"/>	2 - Assigned frequency band 36000 kHz	6a - Class of station TC	6b - Nature of service	6c - Ex-perim. station	3a - Date Col. 2c Day Mo. Year 31 12 92	10 - Run hours of oper. From (UTC) To (UTC) H Min. H Min. 00 00 24 00
STATION CHARACTERISTICS 4a - Name of the receiving earth station T2-3 METER			4b - Country **		4c - Geographical coordinates Longitude Degrees Min. Sec. Deg. Min. Sec. Latitude Degrees Min. Sec. Deg. Min. Sec.	
			4d - Special Section AR/11/A (RR 1042) 158		4e - Special Section AR/11/C (RR 1060)	

ASSOCIATED SPACE STATION

FOR ALL TYPES OF SPACE STATIONS: 5a - Name of the transmitting space station or identity of the satellite network USASAT		FOR GEOSTATIONARY SATELLITES ONLY: 5b - Nom. orbit long. Degrees 62 0 W		5c - Designation of transmitting satellite beam NW	Fill in a separate form for each satellite beam used by the earth station
---	--	--	--	--	---

CHARACTERISTICS OF ENTRIES PERTAINING TO THE ASSIGNMENT

6a - maximum isotropic gain ± dB +40 0	6b - Beamwidth Degrees 1 64	6c - Elevat. angle Degrees	6d - Operating azimuthal angles From (Degrees) To (Degrees)	6e - Radiation pattern: give Reference pattern, or M in ATT. No. 2 29-25LOG(FI)	6g - Altitude Metres	6h - Receiving system noise temperature Kelvin 125	Note: For horizon elevation diagram (8d) fill in ATT. No. 1
---	--	-------------------------------	--	--	-------------------------	---	--

CHARACTERISTICS SPECIFIC FOR EACH ENTRY

1) Entry No. 1	2) ADD <input type="checkbox"/>	3) MOD <input type="checkbox"/>	4) SUP <input type="checkbox"/>	7a - Designation of emission 500KG1D	9b - Satellite link noise temperature Kelvin 128	9c - Transmission gain ± dB -27 0
For additional entries use separate sheet				9b + 9c only for geostationary space stations with simple frequency changing transponder		

OTHER RELATED INFORMATION

11 - Coordination - coordinated under RR 1060 or RR 1107 with: - or coordination requested under RR 1060 with:	
RR Provisions RR 1060	Country symbols USA/IT
12 - Agreements with respect to other provisions of the RR	
RR Provisions	Country symbols

OTHER INFORMATION OR REMARKS

<p>* 13a - ARC Professional Services Group, Inc ** 4b - USA, PTR & VIR</p>	If supplied on separate sheet(s), indicate the number
--	---

ATTACHMENTS

ATT No.	Item of AP3/C	Description	Tick If included
1	8d	Horizon elevation diagram	
2	8c	Antenna radiation diagram	
3	7b, c; 8h	Information used for coordination	
4	-	List of assigned frequencies for assignments with all other characteristics identical	<input checked="" type="checkbox"/>

13a - Operating Administration or Company *	13b - Administration responsible for the station A
--	---

12 July 1989

Page 2 of 2

ATTACHMENT No. 4 to AP3/C

List of assigned frequencies for assignments with all other characteristics identical:

3720 MHz
3760 MHz
3800 MHz
3840 MHz
3880 MHz
3920 MHz
3960 MHz
4000 MHz
4040 MHz
4080 MHz
4120 MHz
4160 MHz

ARC Professional Services
Group, Inc.
Application for TDRS-5
at 62° W.L.
January, 1990

APPENDIX 3

Cost Estimate for Operation of C-Band Capacity on TDRS-5
and
Consolidated Balance Sheet for
Sequa Corporation
Including its Subsidiary,
ARC Professional Services
Group, Inc.
as of December 31, 1988

ARC has ample financial resources available to it for full implementation of its proposed provision of domestic service using the C-band capacity on TDRS-5. A pro-forma four year statement describing estimated investment costs and operating expenses (in thousands of dollars) is provided below:

PRO-FORMA STATEMENT
OF USES OF FUNDS FOR
ARC TDRS-5 C-BAND SERVICE

	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>
Purchase of Control Earth Station Equipment	\$1,250	0	0	0
Costs of Designing, Managing and Operating TDRS-5 C-band System and Providing Transponder Service	450	500	500	500

It should be noted that the Commission has issued ARC's predecessor in interest an STA to operate TDRS-1 at 62° W.L. The difference in cost of operating TDRS-5 instead of operating TDRS-1 at 62° W.L. is minimal. The total cost of managing the system in 1991 (the first year of operation of TDRS-5 at 62° W.L.) is estimated at \$1.7 million.

As can be seen from the attached financial statements of Sequa Corporation, the parent corporation of which ARC is a 100% subsidiary (through an intervening corporation, Atlantic Research Corporation), ARC has ample assets to cover these costs.

my/jge02(1)proforma

CONSOLIDATED BALANCE SHEET
Sequa Corporation and Subsidiaries

At December 31,	1988			1987
<i>Amounts in thousands</i>	Operations, excluding Financial Services	Financial Services	Consolidated Total	Consolidated Total
ASSETS				
Current assets				
Cash and cash equivalents	\$ 60,124	\$ 4,050	\$ 64,174	\$ 48,203
Short-term investments	4,659	—	4,659	39,290
Receivables (less allowances of \$5,840 and \$6,118)	183,446	12,012	195,458	246,551
Unbilled receivables, net (Note 6)	84,438	—	84,438	75,139
Inventories (Note 7)	250,486	—	250,486	207,081
Net assets of discontinued operations	115,589	—	115,589	140,787
Investment in leasing assets (Note 9)	—	31,709	31,709	12,752
Other current assets	37,656	2,141	39,797	46,224
Total current assets	736,398	49,912	786,310	816,027
Investments				
Investment in leasing assets (Note 9)	—	238,153	238,153	101,913
Non-current receivables	15,669	33,285	48,954	41,172
Other investments	616	22,521	23,137	20,758
	16,285	293,959	310,244	163,843
Property, plant and equipment, net (Note 8)	422,519	21,501	444,020	407,316
Other assets				
Deferred charges and other	14,940	1,111	16,051	15,000
Excess of cost over net assets of companies acquired (Note 2)	402,462	—	402,462	365,952
	417,402	1,111	418,513	380,952
Total assets	\$1,592,604	\$366,483	\$1,959,087	\$1,768,138

The accompanying notes are an integral part of the financial statements.

At December 31,	1988			1987
<i>Amounts in thousands, except share data</i>	Operations, excluding Financial Services	Financial Services	Consolidated Total	Consolidated Total
LIABILITIES AND SHAREHOLDERS' EQUITY				
Current liabilities				
Bank loans and notes payable (Note 10)	\$ 43,113	\$ —	\$ 43,113	\$ 49,528
Current maturities of long-term debt (Note 10)	23,803	14,113	37,916	50,352
Accounts payable	121,462	18,796	140,258	133,011
Taxes on income (Note 11)	952	(355)	597	7,658
Accrued expenses (Note 14)	183,774	18,539	202,313	213,161
Total current liabilities	373,104	51,093	424,197	453,710
Long-term debt, net of current maturities (Note 10)	464,529	166,238	630,767	507,058
Deferred taxes and other liabilities				
Deferred taxes on income (Note 11)	14,004	37,085	51,089	55,755
Other liabilities	116,634	35,909	152,543	97,584
	130,638	72,994	203,632	133,337
Shareholders' equity (Notes 10, 12 and 17)				
Preferred stock — \$1 par value, 1,825,000 shares authorized; 797,000 shares and 797,000 shares of \$5 cumulative convertible stock issued at December 31, 1988 and 1987, respectively (involuntary liquidation value — \$33,171 at December 31, 1988)			797	797
Class A common stock — no par value, 25,000,000 shares authorized; 7,042,000 shares and 7,043,000 shares issued at December 31, 1988 and 1987, respectively			7,042	7,043
Class B common stock — no par value, 5,000,000 shares authorized; 3,873,000 shares and 3,883,000 shares issued at December 31, 1988 and 1987, respectively			3,873	3,883
Capital in excess of par value			302,929	303,433
Cumulative translation adjustment			4,352	11,436
Retained earnings			418,317	359,629
			737,310	686,221
Less: cost of treasury stock			36,819	12,218
Total shareholders' equity	624,333	76,158	700,491	674,003
Total liabilities and shareholders' equity	\$1,592,604	\$366,483	\$1,959,087	\$1,768,138

REPORT OF INDEPENDENT PUBLIC ACCOUNTANTS

To the Shareholders and
the Board of Directors,
Sequa Corporation:

We have audited the accompanying consolidated balance sheet of Sequa Corporation (a Delaware corporation) and subsidiaries as of December 31, 1988 and 1987, and the related consolidated statements of income, shareholders' equity and cash flows for each of the three years in the period ended December 31, 1988. These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these financial statements based on our audits. The Company's equity in net income, including discontinued operations, of Chromalloy American Corporation was \$12,945,000 for the year ended December 31, 1986. We did not audit the consolidated financial statements of Chromalloy American Corporation that are reflected in the accompanying consolidated financial statements using the equity method of accounting. These statements were audited by other auditors whose report has been furnished to us and our opinion, insofar as it relates to the amount included for Chromalloy American Corporation, is based solely on the report of the other auditors.

We conducted our audits in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, based on our audits and the report of other auditors, the financial statements referred to above present fairly, in all material respects, the financial position of Sequa Corporation and subsidiaries as of December 31, 1988 and 1987, and the results of their operations and their cash flows for each of the three years in the period ended December 31, 1988, in conformity with generally accepted accounting principles.

As explained in Note 1 to the financial statements, the Company has given retroactive effect to the change in accounting for its wholly-owned Financial Services subsidiaries, which had previously been accounted for by the equity method.

Arthur Andersen & Co.

New York, New York
March 17, 1989

QUARTERLY STOCK PRICE DATA

Shares of Sequa Class A common stock and Sequa Class B common stock are listed on the New York Stock Exchange. The following table sets forth the high and low sales prices of these stocks for the calendar periods indicated on the Exchange Composite Tape, as reported by the National Quotation Bureau Incorporated.

	Sequa Class A		Sequa Class B	
	High	Low	High	Low
1987				
First Quarter	79½	69	82	72½
Second Quarter	75¾	72½	79¾	75
Third Quarter	58¾	71	91¾	73½
Fourth Quarter	57	41	58½	43½
1988				
First Quarter	68	51	70½	52
Second Quarter	65¾	60¾	71¼	65¼
Third Quarter	67	60	70¼	65
Fourth Quarter	65¾	57¼	69½	62

ARC Professional Services
Group, Inc.
Application for STA for
TDRS-5
January, 1990

APPENDIX 4

Technical Qualifications

Appendix 4 - Technical Qualifications

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ARC Professional Services Group, Inc.

Technical Qualifications To Provide
Domestic Service Via TDRS-5 at 62° W.L.

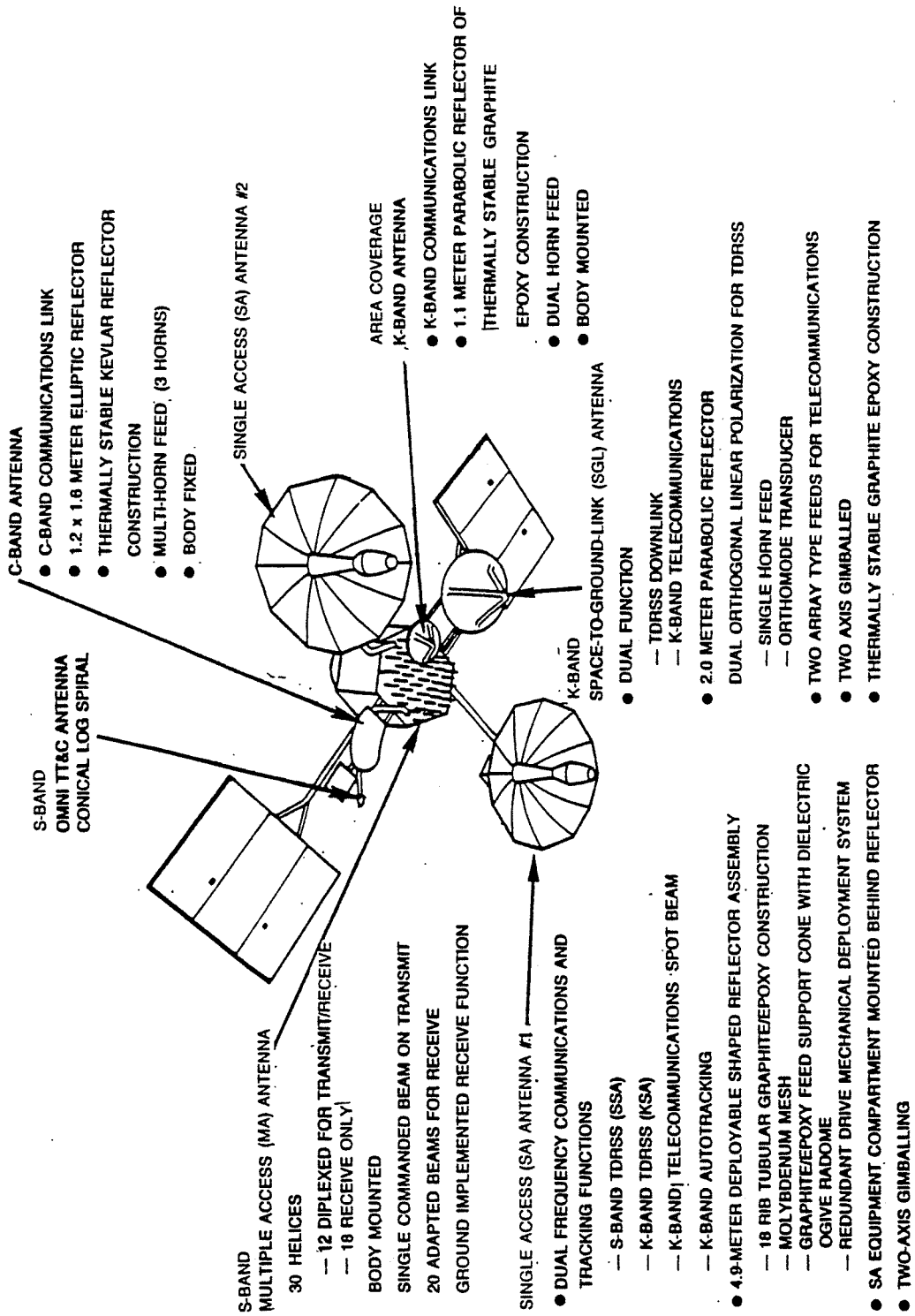
1. Introduction

ARC Professional Services Group, Inc. (ARC) is applying for special temporary authority to operate a domestic communications satellite in the 4- and 6-GHz bands and to locate that satellite at 62° West Longitude ("W.L.").

2. General Description

The TDRSS satellite illustrated in Figure 1 contains NASA S-band and K-band data relay service equipment as well as S-band and K-band TT&C equipment in addition to the C-band transponders which are the subject of this request.

The C-band transponder complement consists of twelve 36 MHz transponders having a nominal 36 dBW maximum EIRP (32.5 dBW EIRP over the continental U.S.). The satellite is intended to be launched by the Space Transportation System (STS), also called the Space Shuttle, in conjunction with the Boeing Inertial Upper Stage (IUS), which is capable of launching 5,000 pounds into geostationary orbit.



Antenna Subsystem

Figure 1

The satellite is three axis stabilized. Attitude is maintained by a combination of earth sensors, gyros, inertia wheels, and hydrazine thrusters. The hydrazine thrusters also provide the means for stationkeeping.

The in-orbit TDRS system for NASA's Tracking and Data Relay function will be comprised of three satellites, two to provide near global K-band and S-band coverage of low orbit satellites and a third, which will be an in-orbit spare. Because of operational considerations related to NASA activities and the need to serve all three satellites from NASA's main TT&C station at White Sands, N.M., the location of the two operational TDRS satellites must be located at 41° W.L. and 171° W.L. The third in-orbit TDRS spare may be at any position in between. All three TDRS satellites are considered operational (no in-orbit spare) from the viewpoint of 4/6 GHz (C-band) operation, which is the subject of this request. The satellite which is the subject of this request is the middle satellite which will serve as the spare for TDRS purposes. It will be located at 62° W.L.^{1/}

^{1/} Construction of the commercial portion of the TDRS system was originally authorized in Western Union Telegraph Company, 86 F.C.C. 2d 196 (1981). There the Commission authorized the construction of the commercial portions of five complete TDRS/Advanced Westar space stations, the construction of components for a sixth TDRS/Advanced Westar space station, and the construction of parts for a seventh TDRS/Advanced Westar space station. Aside from the three TDRS spacecraft which will form the in-orbit part of the TDRS system, a fourth TDRS satellite was lost in the

International TDRS C-band coverage will be accomplished by two in-orbit satellites located at 41° W.L. (TDRS-4) and 171° W.L. (TDRS-3). TDRS-1, at 79° W.L. is currently the in-orbit spare satellite for the TDRS system. However, when TDRS-5 is launched in January, 1991, it will replace TDRS-1 as the primary in-orbit spare. TDRS-1 will be retained in-orbit at the 79° W.L. location.

3. Number and Location of Earth Stations

An indeterminate number of receive-only, transmit/receive or transmit-only earth stations will be installed initially in the United States within the coverage area of the satellite's antenna pattern.

An existing TDRS Control Ground Station for the entire TDRS system is located at White Sands, N.M. and uses encrypted links at Ku- or S-band for all control and telemetry (including the C-band transponders). Control and telemetry functions pertaining to the C-band transponders must employ these links. This

Challenger explosion. The fifth TDRS satellite is the subject of the instant application. The partially constructed sixth and seventh TDRS satellites, whose construction was authorized in Western Union Telegraph Company, supra, are on-ground spares for the TDRS system. However, ARC is not at this time seeking any authorizations with respect to the commercial portion of these on-the-ground spare TDRS satellites.

control ground station has no C-band receive or transmit capability.

The ARC C-band monitoring and control earth station will be connected to the TDRS Control Ground Station via a dedicated communication link to provide for the C-band telemetry and control functions to be exercised by ARC.

The TT&C earth station design concept features redundant elements in the transmitting and receiving systems to maintain monitoring and control of functions in the event specific system elements fail. Adequate spares will be on hand to enable rapid changeout of defective components.

4. Launch Vehicle

NASA intends to launch the satellite using NASA's Space Transportation System (Shuttle) in January 1991, and position it at 62° W.L.

5. Tracking, Telemetry and Control

The TDRSS TT&C system is fully encrypted and can only be operated via the existing TDRS Control Ground Station at White Sands, N.M. It operates on government frequencies at Ku-band with an S-band backup. The operating frequencies, polarization,

bandwidth and power into the antenna are covered by a government allocation. No separate TT&C link for C-band service is required (or possible). C-band operations will be controlled by ARC through its monitoring and control earth station. ARC will have the capability to turn the TDRS C-band transponders on and off through a communications interface with the Spacecom-operated TDRS Control Ground Station.

6. Radio Frequency Plan and Transponder Technical Characteristics

The radio frequency utilization plan involves transponder reception in the 5.925-6.425 GHz band with retransmission in the 3.700-4.200 GHz band. The payload consists of twelve 36 MHz transponders of a capability equivalent to those employed in the Westar series of domestic communication satellites. Signals are received at the satellite through an offset-fed shaped beam reflector antenna in the 5.925 to 6.425 GHz frequency band using linear vertical polarization. The signals are then amplified and frequency translated to the 3.7 to 4.2 GHz band and broadcast via the same antenna using linear horizontal polarization. Frequency assignments for the twelve channels are given in Table 1. Guard bands of 4 MHz are provided between channels, as illustrated in Figure 2.

As previously noted on page 3 of this Appendix, telemetry and telecommand functions are combined with the overall TDRS TT&C links from the existing TDRS Control Ground Station and are therefore not a part of this request.

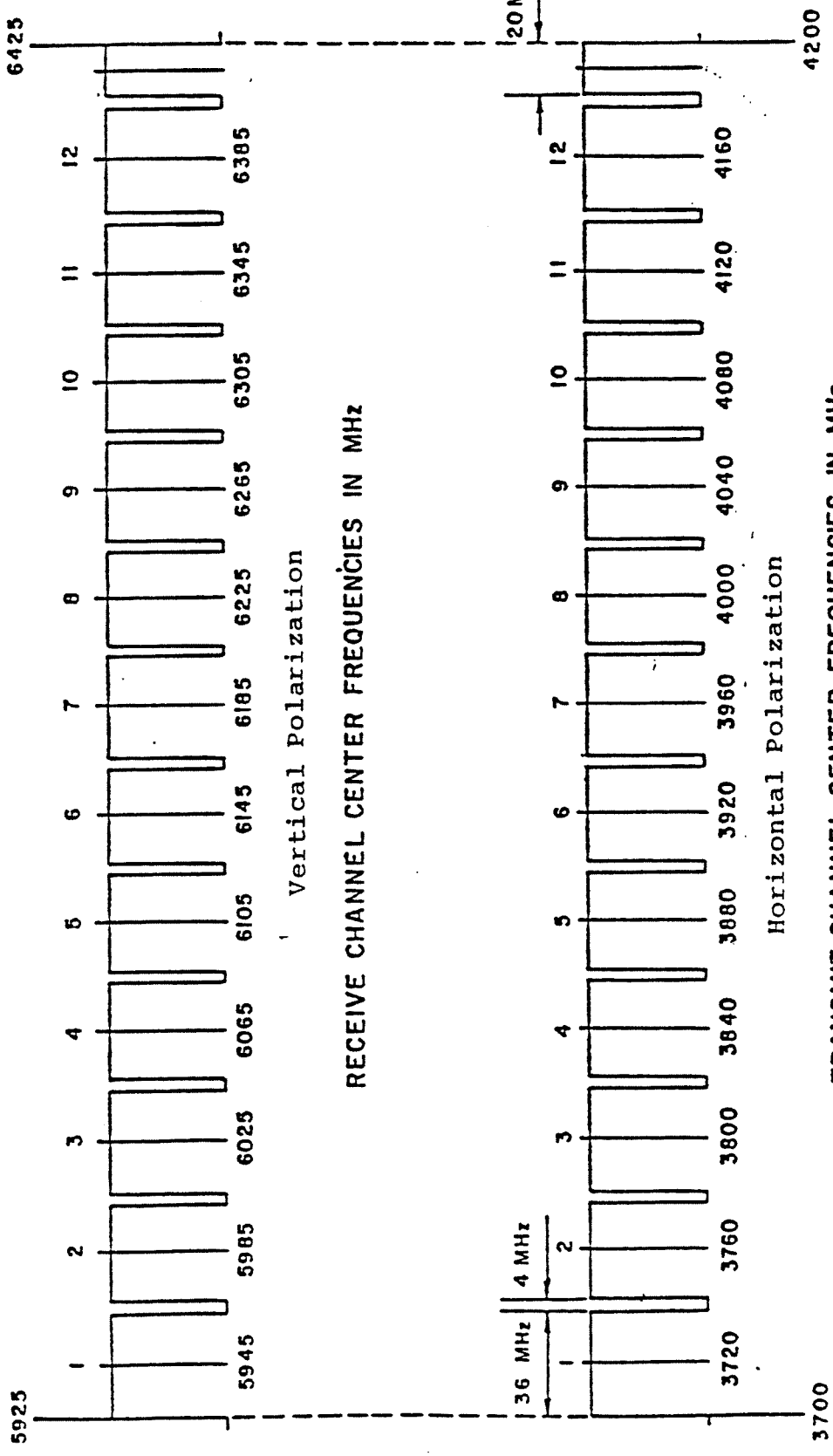
The design of the TDRS C-band transponders does not provide for a separate beacon at C-band. The transmit capability of the ARC control and monitoring station will be used to provide a temporary beacon signal for C-band users within the bandwidth of a particular transponder on a temporary, as-needed basis.

Table 1
C-band Frequency Assignments

<u>Channel Number</u>	<u>Receive Frequency (MHz)</u>	<u>Transmit Frequency (MHz)</u>
1	5927-5963	3702-3738
2	5967-6003	3742-3778
3	6007-6043	3782-3818
4	6047-6083	3822-3858
5	6087-6123	3862-3898
6	6127-6163	3902-3938
7	6167-6203	3942-3978
8	6207-6243	3982-4018
9	6247-6283	4022-4058
10	6287-6323	4062-4098
11	6327-6363	4102-4138
12	6367-6403	4142-4178

The emission designators applicable to the C-band transponder depend on the type of traffic being carried. Based on current traffic estimates the following emission designators would apply:

TV/FM:	36M0F3F
Digital QPSK:	30M0G1D
SCPC/FM:	50K0F3E
Digital SCPC:	100KG1D



C-BAND FREQUENCY AND POLARIZATION PLAN

Figure 2 GuardBands

The C-band saturated transmitter output is 7.4 dBW at End of Life (EOL). The multiplexer line loss channel is 0.9 dB producing 6.5 dBW maximum available at the antenna system input port. The satellite receiver temperature is 1750°K.

7. Calculation of Power Flux Density

Table 2 presents, for each type of service, the power flux density generated at the earth's surface by the TDRS C-band operations. As can be seen, none of the links violates the limits specified in FCC rule 25.208(a).

Table 2

Calculation of Maximum Power Flux Density Levels

	<u>TV/FM</u>	<u>Digital</u>	<u>SCPC-PSK</u>	<u>SCPC-FM</u>
Satellite EIRP	34.8	35.8	1.8	2.8
Bandwidth (MHz)	2 ¹ / ₁	29.0	0.100	0.050
EIRP/4 kHz	7.8	-2.8	-12.2	-8.2
Spreading Loss (dB) ² / ₂	<u>-162.0</u>	<u>-162.0</u>	<u>-162.0</u>	<u>-162.0</u>
Power Flux Density (dBW/m ² /4 kHz)	-154.2	164.8	-174.2	-170.2

-
- ¹/₁ Energy dispersal bandwidth
²/₂ Minimum Value (nadir)

The nominal small signal transponder gain from receiver input to transponder output is 106.5 dB. No adjustable gain steps are provided. Frequency response of the transponder is governed principally by the input and output multiplexers.

The specified input frequency response for the transponders is illustrated in Figure 3. The specified output frequency response is illustrated in Figure 4.

Typical frequency response of the input frequency multiplexer is illustrated in Figure 5.

Typical frequency response of the output frequency multiplexer is illustrated in Figure 6.

Typical frequency response of the transponder is illustrated in Figure 7.

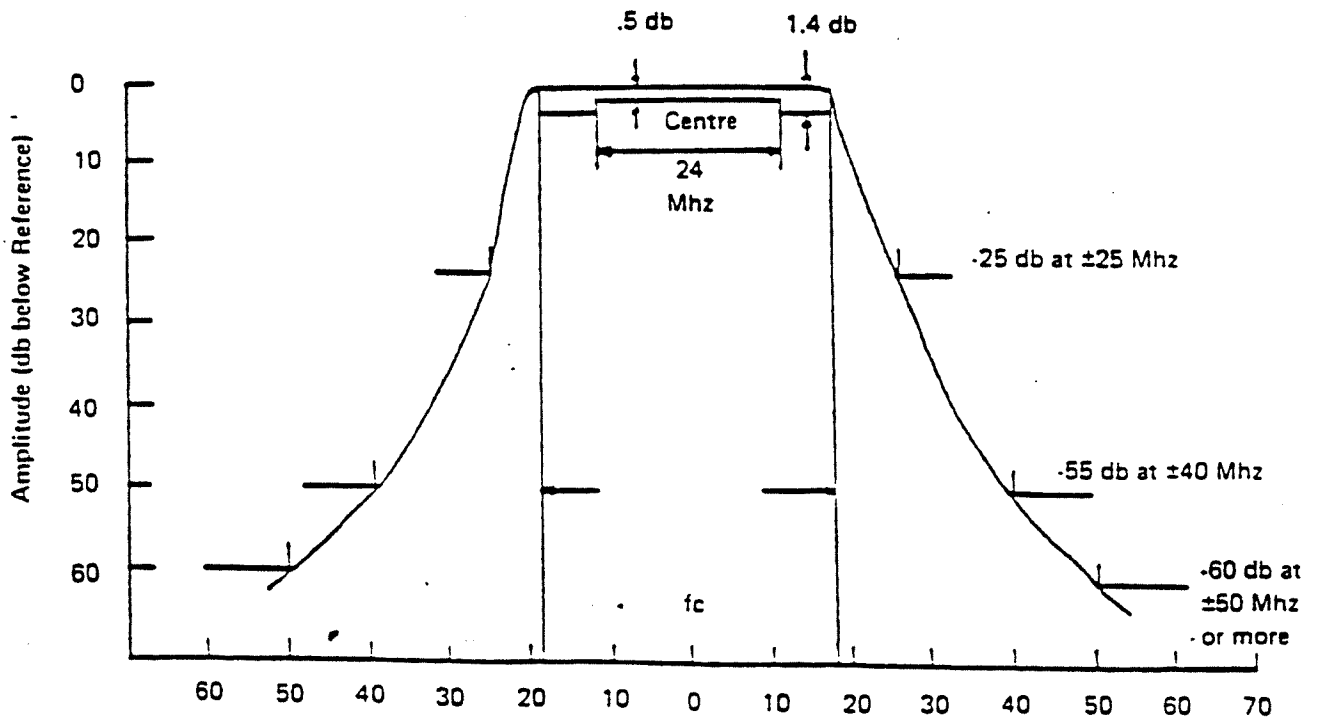


Figure Specified Input Frequency Response

Figure 3

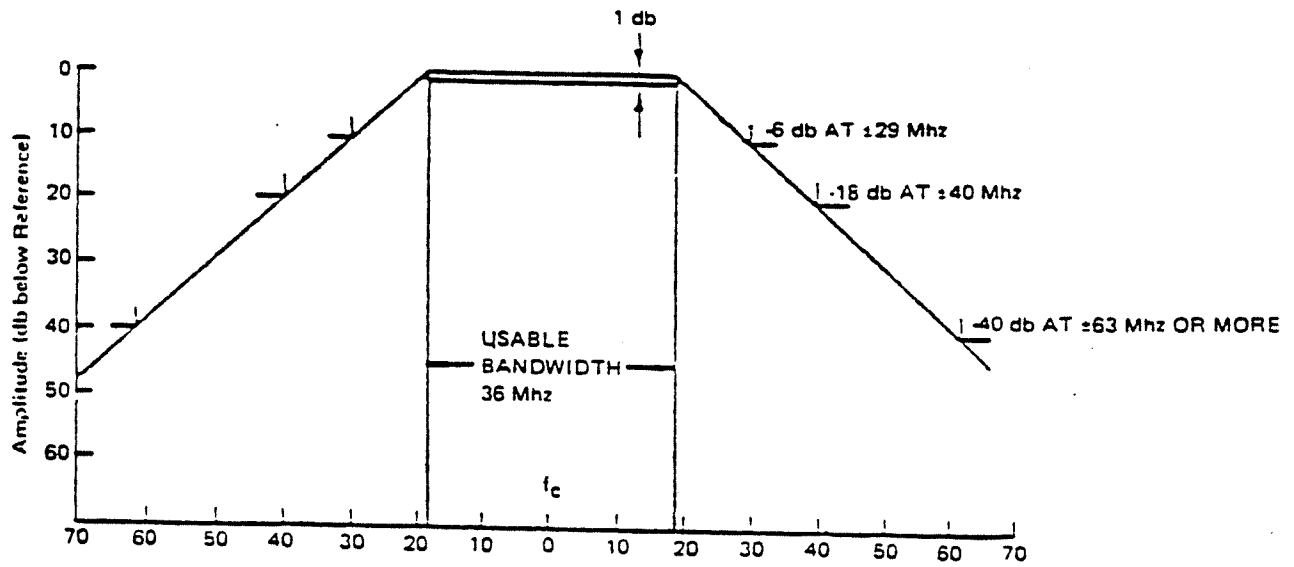


Figure 4 Specified Output Frequency Response

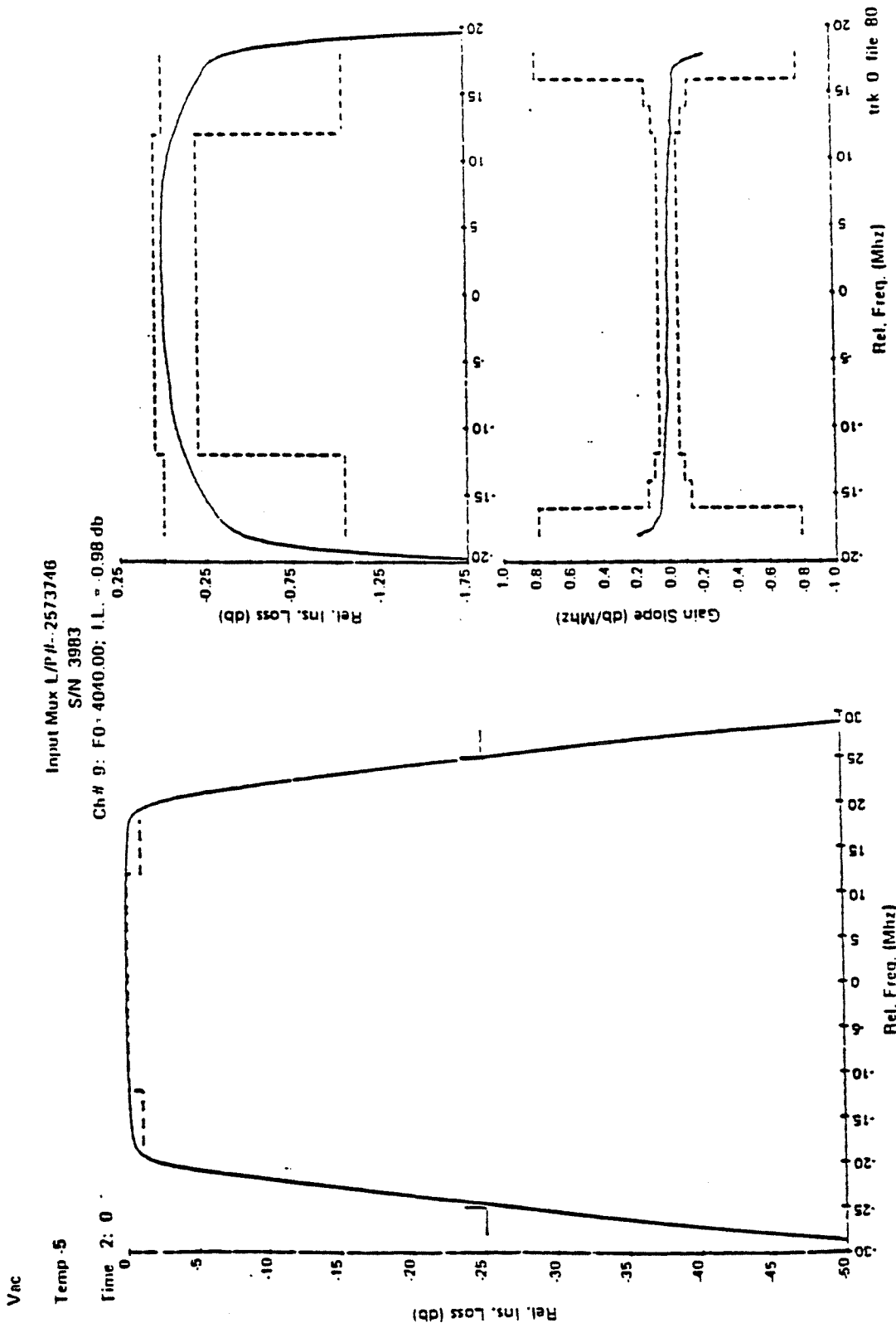


Figure 5 Typical Measured Input Frequency Response (Input Multiplexer Only)

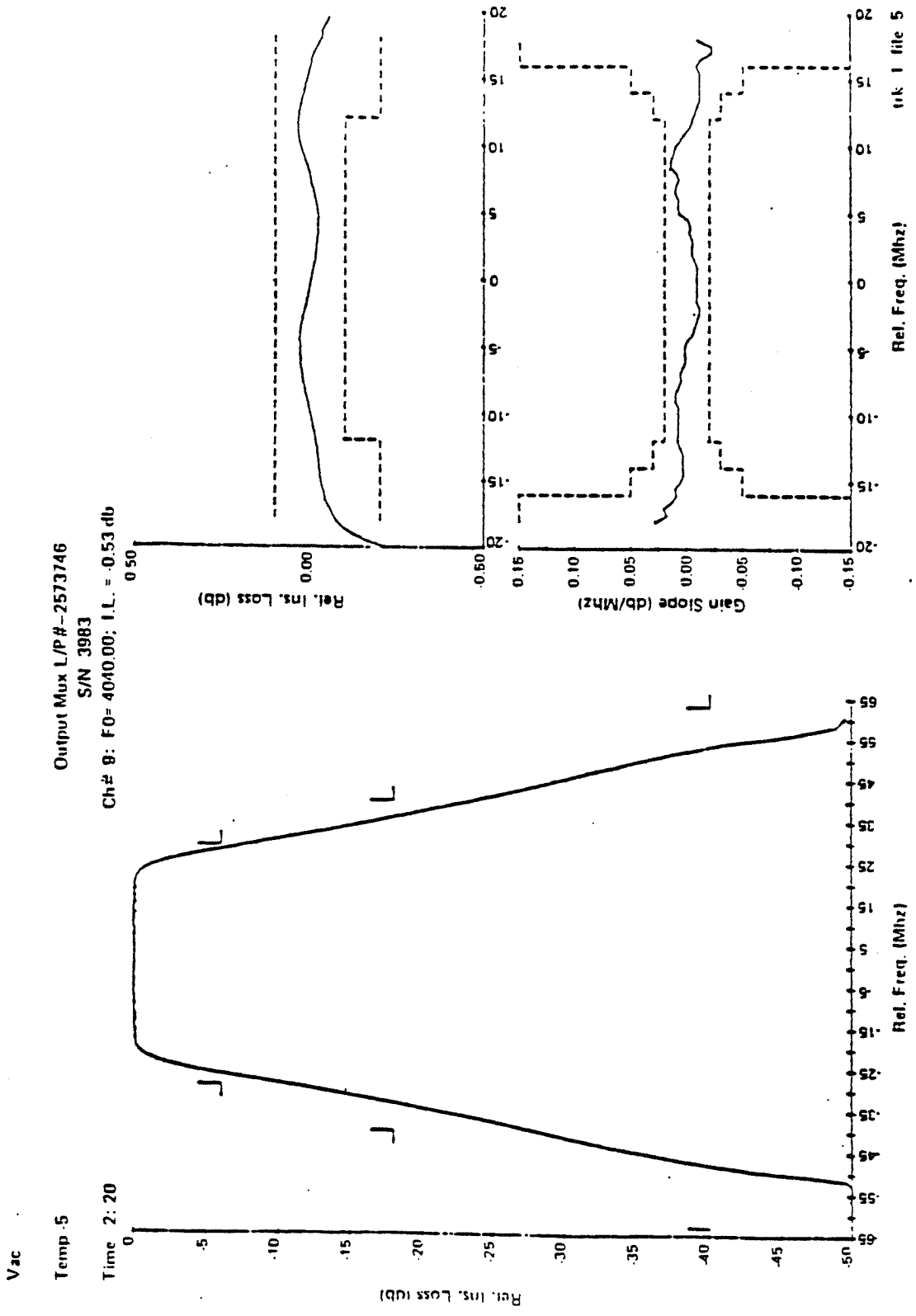


Figure 6 Typical Measured Output Frequency Response
(Output Multiplexer Only)

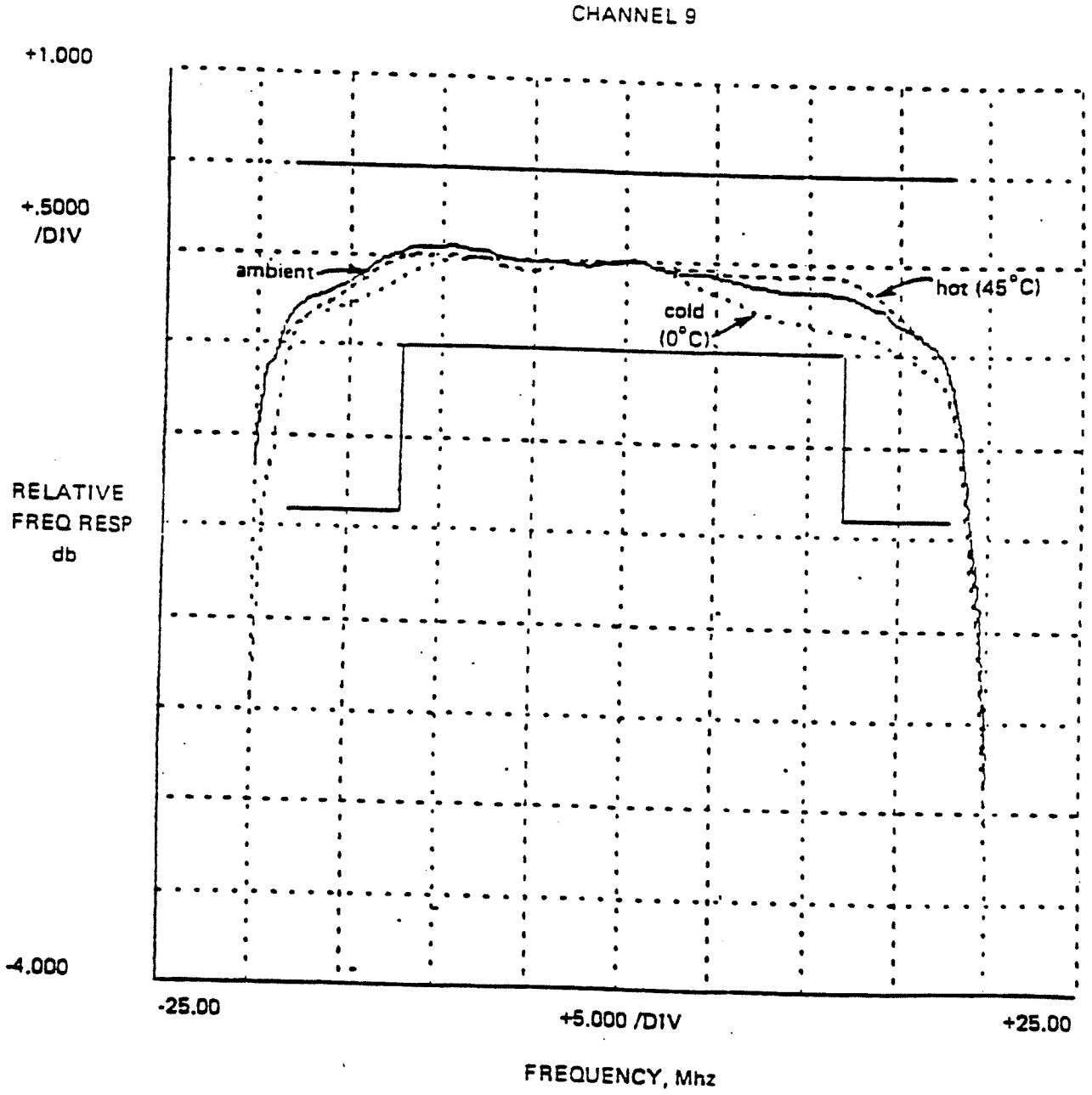


Figure 7 Typical Overall Channel Amplitude Response

The specific TT&C functions take place over transponders which operate over S-band and K-band frequencies assigned to U.S. Government use. These have already been approved by cognizant authorities.

8. Space Station Coverage Contours

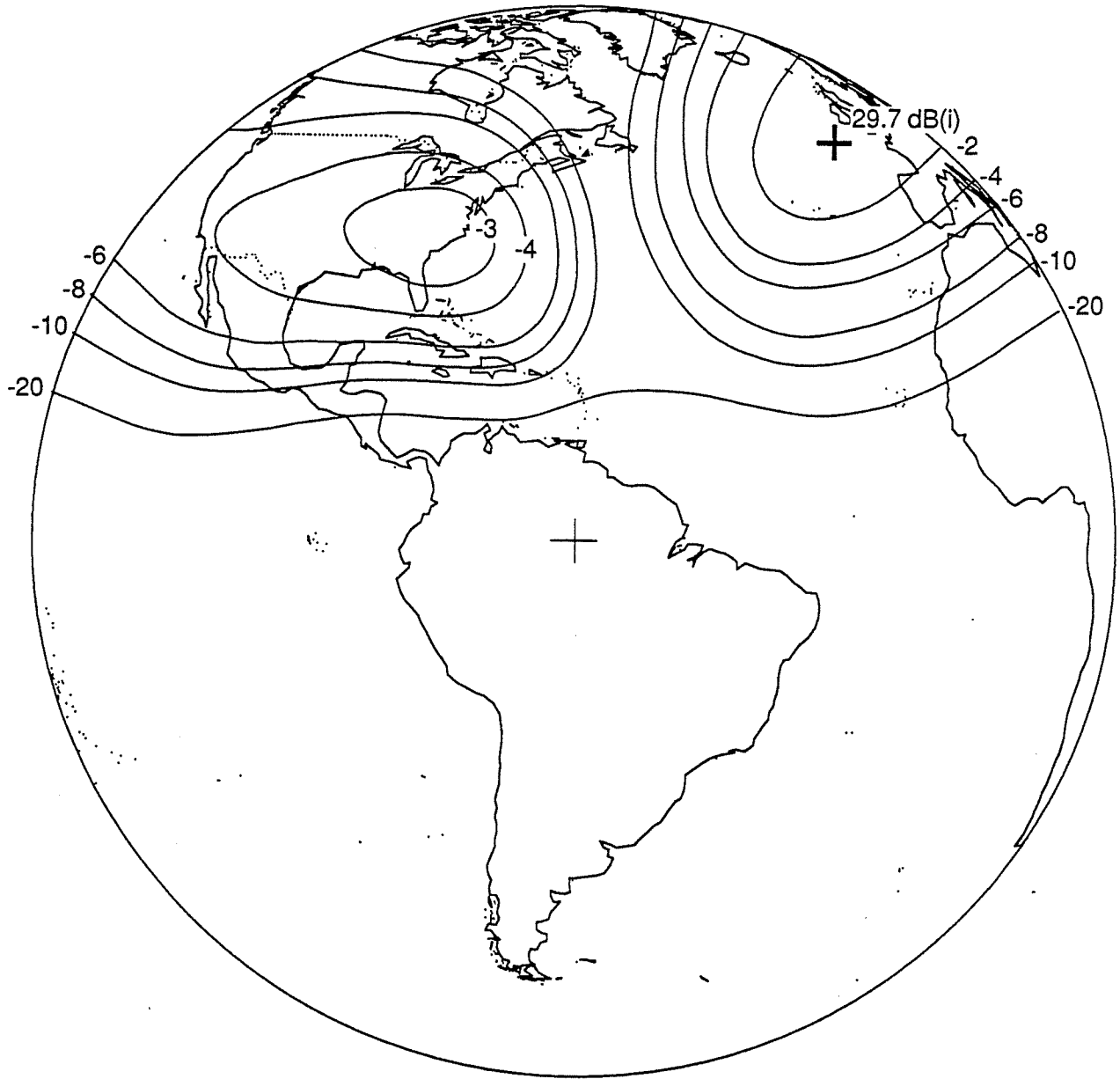
The expected coverage contours from the 62° W.L. location for the transmit and receive antenna are shown in Figures 8 and 9, providing coverage of the U.S. from single shaped uplink and downlink beams. These gain contours are overlaid on perspective maps of the world showing the coverage area for the satellite.

EIRP contours can be determined from the transmit antenna gain contours by adding 6.1 dBW to the gain contour values. Similarly G/T contours can be obtained by subtracting 33.1 dB/K from the receive gain contour values. The transponder saturation flux density can be obtained by subtracting the receive gain contour value from -53.8 dBW/m^2 .

A functional block diagram of the satellite transponder is shown in Figure 10. The satellite employs 2 redundant C-band receivers, which may be selected and powered on or off by ground command. The receiving antenna pattern is formed by phasing network. The receivers convert the uplink 5925-6425 MHz signal to the downlink band 3700-4200 MHz. The signal is supplied via

10-A

62 W

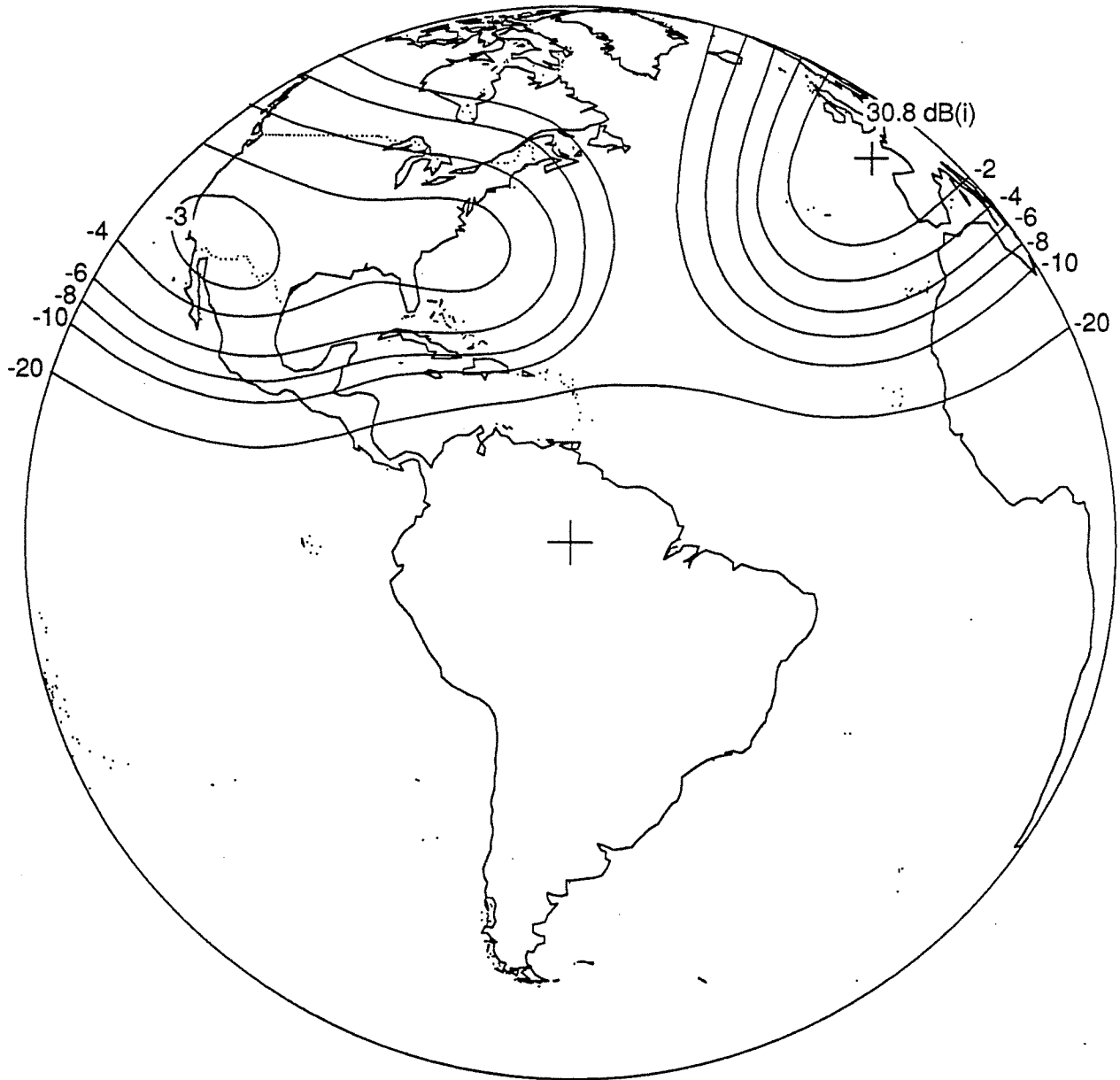


Transmit Gain Contours (62° W)
This Figure Includes Pointing Errors

Figure 8

10-B

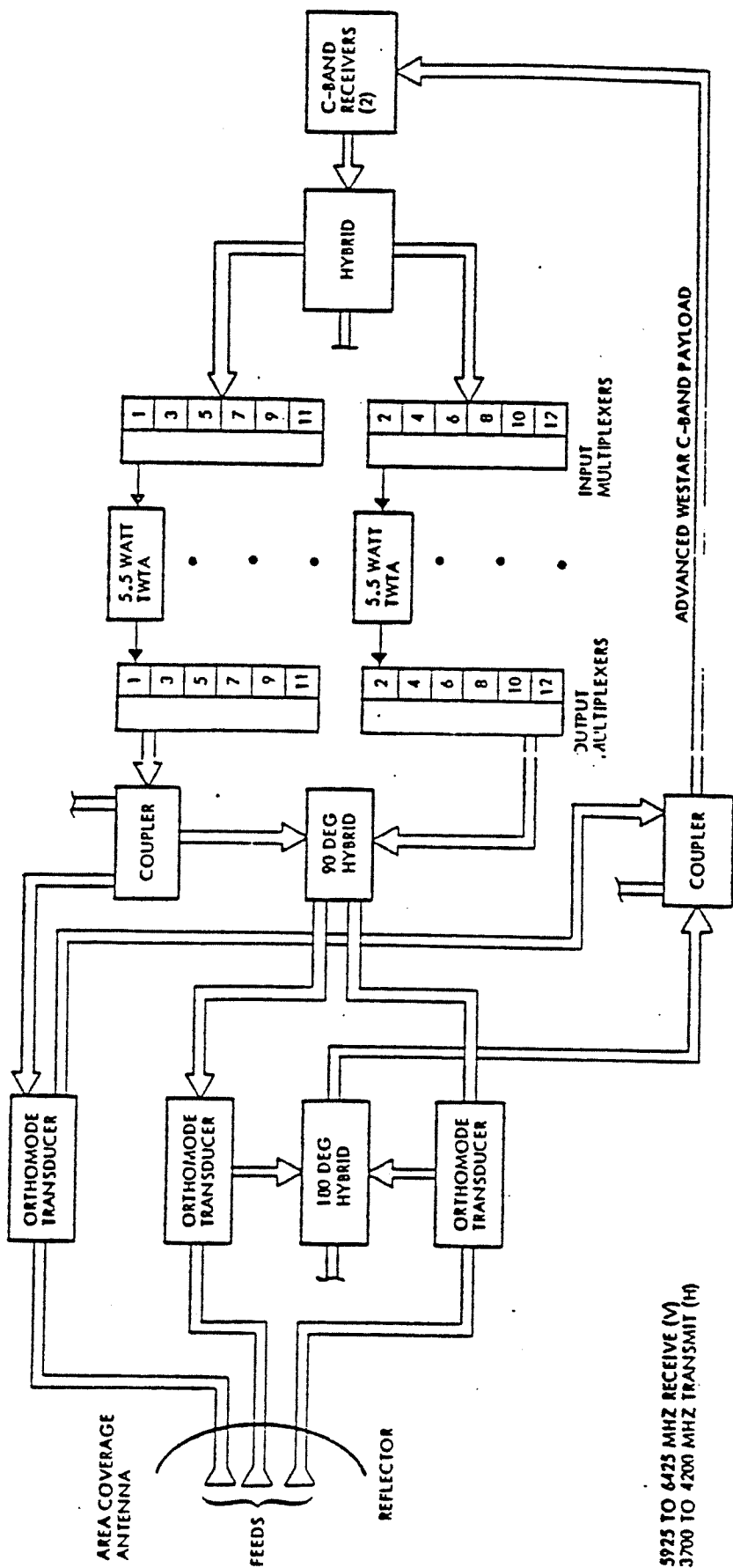
62 W



Receive Gain Contours (62° W)

This Figure Includes Pointing Errors

Figure 9



5925 TO 6425 MHZ RECEIVE (V)
3700 TO 4200 MHZ TRANSMIT (H)

C-BAND COMMUNICATIONS PAYLOAD

Figure 10

a hybrid network to two banks of multiplexers, associated with odd and even channels. The separated 36 MHz channels are then each used to drive individual channel 5.5 W TWT amplifiers. Output of the amplifiers is then combined by use of output multiplexers and supplied to the two input ports of the antenna phasing system which in turn provides the signals to the antenna horns.

Separation of the orthogonally polarized signals for receiving and transmitting is achieved by means of orthomode couplers associated with each horn.

Each of the 12 C-band TWTAs may be commanded on or off from the ground facility at White Sands, New Mexico.

9. Physical Characteristics of the Space Station

The space station is a three axis stabilized communications satellite, which supports multiple communications functions. The overall configuration of the satellite is shown in Figure 1 (page 1-A). The satellite consists of a main body which contains power subsystem, tracking, telemetry and command, attitude control system, as well as communications modules. Mounted on the earth facing side of the main body are 30 helix antennas which support multiple access communications. Also located on the body is a K-band communications antenna. Two

large steerable single access antennas are located on booms extending from opposite sides of the spacecraft body. Perpendicular to this axis are booms supporting two solar arrays. On one of these booms is located the space-to-ground link antenna. The orientation of the C-band antenna is fixed with respect to the spacecraft. This antenna is designed to function in the commercial domestic satellite bands. The communication system which is the subject of this request will make use of this antenna and its associated transponders.

Figure 11 contains a view of the earth pointing face of the spacecraft in the deployed configuration, and gives the overall dimensions of the spacecraft; and in addition illustrates the pointing limits for the space-to-ground link antenna, and the two single access antennas.

A side view of the spacecraft is illustrated in Figure 12.

The satellite is intended to be launched by the Space Transportation System (STS) also known as the Space Shuttle in conjunction with the Boeing Inertial Upper Stage (IUS), which is capable of launching 5,000 pounds into geostationary orbit. The weight summary for the spacecraft is given in Table 3.

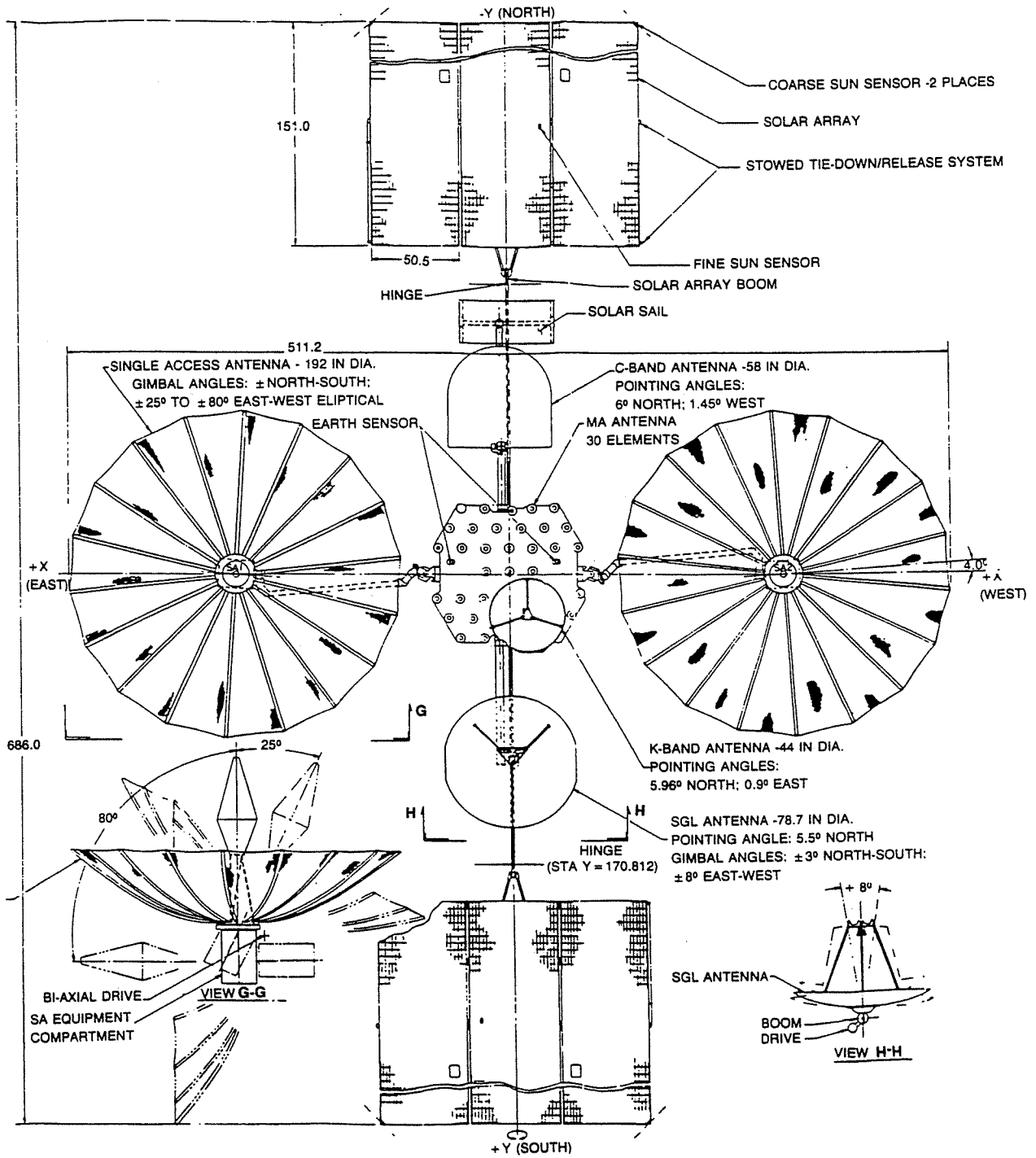


Figure 11 Deployed Spacecraft Earth Pointing Face

12-B

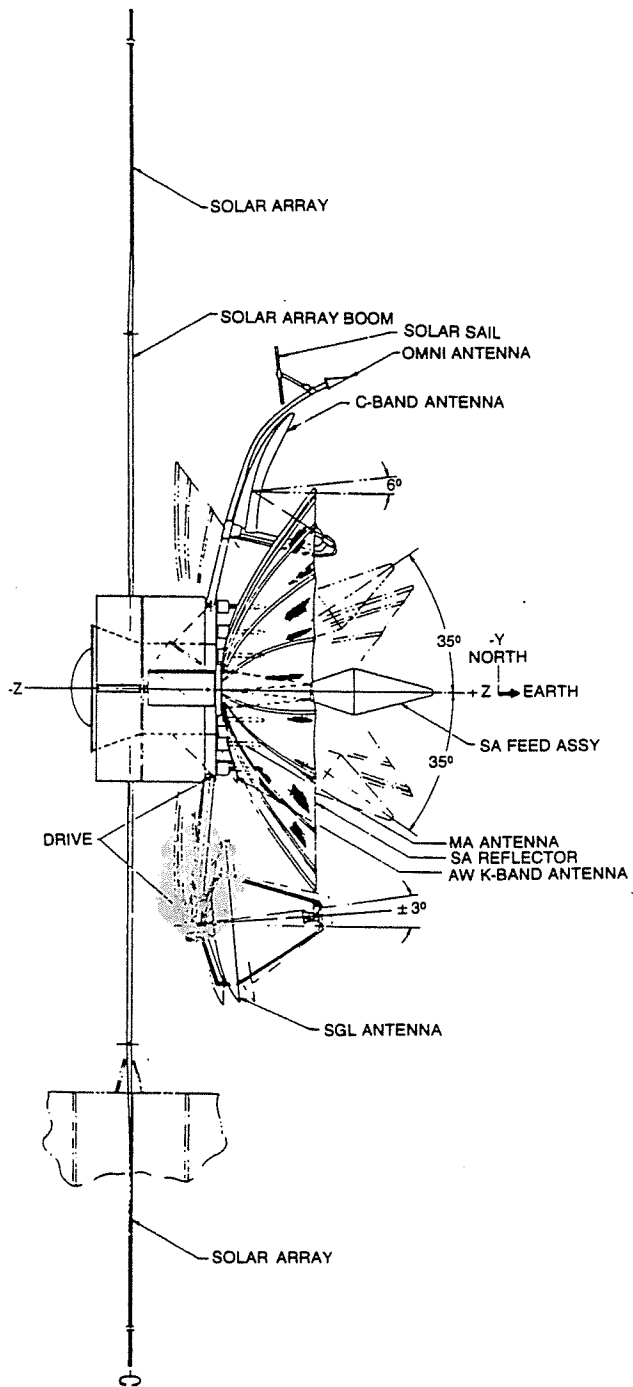


Figure 12 Spacecraft Display Configuration (Side View).

Table 3

WEIGHT SUMMARY

<u>SUBSYSTEM</u>	<u>WEIGHT (POUNDS)</u>
TELECOMMUNICATIONS	
- ELECTRONICS	651.4
- ANTENNAS	192.9
TT&C	107.5
ATTITUDE CONTROL	212.6
PROPULSION	190.8
ELECTRICAL POWER	912.4
THERMAL	95.0
STRUCTURES	<u>976.0</u>
SPACECRAFT DRY WEIGHT	3338.6
- CONTINGENCY/MARGIN	5.7
- PROPELLANT/PRESSURANT	<u>1327.8</u>
SPACECRAFT AT SEPARATION	4672.1
ADAPTER	265.9
IUS CHARGEABLE WEIGHTS	<u>62.0</u>
SPACECRAFT AT LAUNCH	5000.0

10. Orbit Parameter Accuracy and Antenna Pointing Accuracy

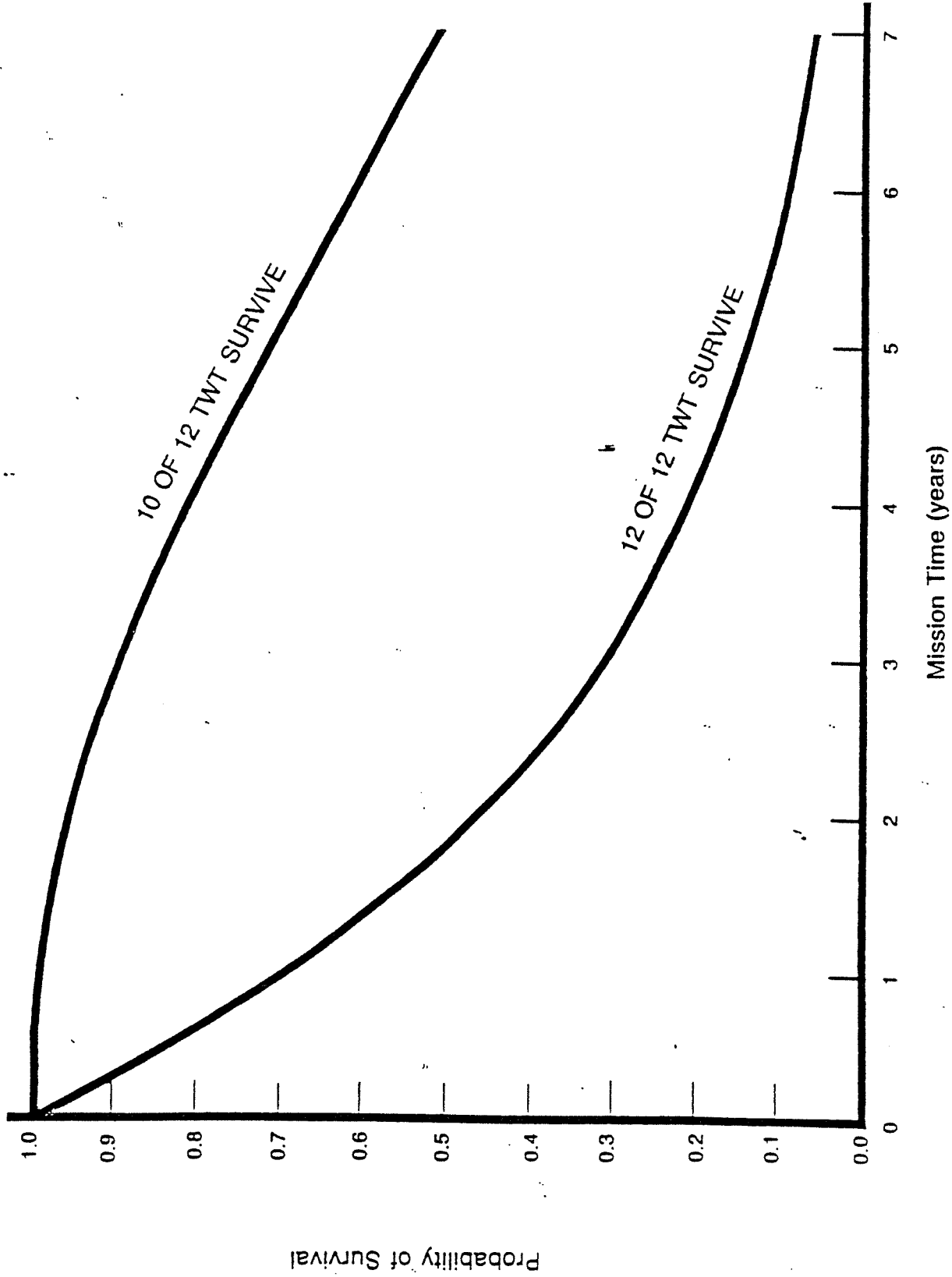
The TDRS spacecraft will be launched into a 0° inclination geostationary orbit. Stationkeeping maneuvers regulating orbital inclination and longitudinal drift will cause the satellite position to be maintained within a 0.1° by 0.1° N/S, E/W rectangle as required by Commission regulations applicable to domestic communications satellites.

The pointing error of the C-band antenna including the effects of combined spacecraft attitude and pointing errors, as well as errors in the alignment of the C-band antenna with respect to both the spacecraft body and other antenna is calculated to have a maximum 3 sigma radius of 0.3°.

11. Estimated Lifetime

The estimated lifetime of the satellite in orbit is 7 years. This expectation is based on rate of expenditure of the hydrazine propellant, and reliability considerations regarding the payload. It is expected that a useful portion of the payload will still be operational after 10 years in orbit.

Figure 13 shows a reliability block diagram for the C-band payload. Figure 14 is a graph showing the probability of survival of 10 of 12 transponders and 12 of 12 transponders as a



C-BAND TRANSPONDER (WITH POWER, COMMAND AND TELEMETRY) SURVIVAL CURVES.

Figure 1.4

function of years in orbit.

12. Spacecraft Attitude Control Subsystem

The satellites are three axis stabilized. After being placed in synchronous orbit by the Interim Upper Stage (IUS) vehicle, and following separation from the IUS, the spacecraft attitude is maintained by a combination of earth sensors, gyros, inertia wheels and hydrazine thrusters coupled with ground generated commands as described below.

(a) Separation/Earth Acquisition

After arrival at synchronous orbit, the IUS orients the spacecraft to within 2° of on-orbit attitude. While attached to the IUS, the spacecraft solar arrays, space/ground link antenna, and C-band antenna are deployed. At IUS/spacecraft separation, a separation signal activates the spacecraft attitude control subsystem inertial hold mode and initializes the gyro reference. Control is then provided by three axis thruster firings in response to gyro attitude and rate signals. The inertial hold pointing error is less than 0.5° per axis. When the separation rates are damped, the earth mode for final earth acquisition is enabled by the ground station. During that time, the single access antennas are deployed and the reflectors released. In this mode, thruster

control the spacecraft in response to error signals from the earth sensor for pitch/roll and the gyro for yaw. The error signals are used to control the spacecraft in an attitude deadband equal to 0.15° for pitch and roll and 0.2° for yaw. The infrared earth sensor continuously scans across the earth to determine the angular position of the earth with respect to the sensor axis. The outputs are binary words representing pitch and roll error signals which are generated by each scan.

(b) Normal Mode

Once stabilized in earth mode the ground system will configure the spacecraft for the entry into normal mode operations as follows:

- o Run-up reaction wheels to operating speeds
- o Correct solar array pointing and enable solar array clocking
- o Enable normal mode
- o Disable earth mode and thrusters
- o Reconfigure electronics, turn off gyros

In this mode the spacecraft +Z (yaw) axis is pointed at earth nadir, the +X (roll) axis is aligned with the Velocity vector and the +Y (pitch) axis is perpendicular to the orbit plane.

Attitude control is maintained during normal mode by momentum exchange between on-board reaction wheels and the spacecraft body. Earth sensors measure pitch and roll attitude errors. These error signals are processed in the ASC Control Processor which provides wheel drive commands to the reaction wheel drive electronics which in turn controls wheel speed. It is the modulation of wheel speed that controls three-axis pointing of the spacecraft.

There are four reaction wheels, two of which remain unpowered and are intended for standby redundancy. Each wheel stores 20 ft.-lb-sec. of momentum along its axis at 3100 rpm. The spin axes of the active pair of reaction wheels are arranged in a "vee" configuration in the Y-Z plane with each wheel offset 25 degrees from the Y-axis. When the two active reaction wheels are spun at nominally equal speeds, the total momentum vector lies along the pitch axis (Y-axis), which produces a torque about the pitch axis while the yaw axis (z-axis) component of momentum is cancelled.

In the normal mode, the ACS will control attitude errors to within the following values:

Roll 0.15°

Pitch 0.15°

Yaw 1.0°

These pointing uncertainties are due to a combination of earth sensor errors and the dynamic response of the control loop. The earth sensor errors include noise, earth radiance errors (i.e., the maximum/minimum radiance level differences across the earth), bias errors due to environment effects and supply voltage variation errors. The earth sensor contributes approximately 50% to the total attitude error.

(c) Pitch Control

For pitch axis attitude control, the earth sensor pitch error signal is provided to the Control Processor where wheel drive commands are generated for the Wheel Drive Electronics. The wheel tachometer feedback is compared to the wheel drive command and the difference converted to a proportional voltage for the wheel motor. Both wheels are driven to the required equal speeds to produce the desired pitch axis control torques.

The solar torques about the pitch axis are primarily cyclic (at orbit rate) and cause little net change in wheel speed each day. (Slowing of the single access antenna in the east/west direction also causes a small variation in wheel speed during and following the maneuver. However, wheel speed returns to the value it had at the start of the maneuver.) The

small secular change from solar torques is unloaded by ground commanding single pitch axis thruster firings no more often than once every four days. The wheel will also be automatically unloaded when caged for a velocity change maneuver.

(d) Roll/Yaw Control

For roll axis control, the earth sensor roll error signal is provided to the control processor where commands are generated for the wheel drive electronics. In this case, however, wheel drive commands are generated that produce a differential wheel speed (k.e., one wheel speed increased, the other decreased) resulting in a constant pitch momentum and yaw component of momentum which controls roll pointing by inducing a precessional torque about the roll axis. Yaw axis attitude control is provided passively by the pitch momentum bias producing a yaw stiffness (there is no active yaw attitude error sensing and control law).

This bias momentum approach meets roll/yaw pointing requirements with momentum unloadings no more frequently than once every 2 days.

The momentum dump sequence is ground commanded. The momentum stored along the yaw axis is proportional to the roll attitude error. The appropriate yaw thrusters are fired when

the roll error exceeds a threshold. This results in procession about the roll axis. These thrusters can be fired singularly or fired in couples to remove transverse momentum with minimum spacecraft translation. Orbit perturbations are, therefore, minimized.

The roll/yaw unloadings are performed by two yaw thruster firings separated by half a nutation period. In this way, these two pulses cause no nutation buildup except for the impulse variation between the two thrust segments. After the roll/yaw procession, the pitch wheel is unloaded (if necessary) as described above.

(e) Solar Array Control

The solar arrays are deployed prior to IUS/spacecraft separation. Prior to separation, the solar array is coarsely pointed towards the sun by ground initiated slewing commands which drive the arrays about the spacecraft pitch axis at the rate of 0.281° per second. Following separation, a more precise sun point is established. The ground then commands the ACS to automatically clock solar arrays at a rate of one revolution per day.

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Federal Communications Commission

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WASHINGTON, D.C. 20554

Domestic Facilities Division
Satellite Radio Branch

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In the Matter of the)
Request of)
ARC Professional Services)
Group, Inc.)
For Special Temporary)
Authority to Operate a)
Communications Satellite)
Providing Domestic Fixed)
Satellite Service at 62° W.L.)

File No. 19-DSS-MISC-90

**REQUEST OF ARC PROFESSIONAL SERVICES GROUP, INC.
FOR SPECIAL TEMPORARY AUTHORITY TO PROVIDE
DOMESTIC SERVICE VIA TDRS-5 AT 62° W.L.**

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Date: January 29, 1990

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Appendix 4: Technical Qualifications	
Certification	

BEFORE THE

Federal Communications Commission

WASHINGTON, D.C. 20554

In the Matter of the)
Request of)
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Group, Inc.)
For Special Temporary)
Authority to Operate a)
Communications Satellite)
Providing Domestic Fixed)
Satellite Service at 62° W.L.)

Directed to: Chief, Common Carrier Bureau

**REQUEST OF ARC PROFESSIONAL SERVICES GROUP, INC.
FOR SPECIAL TEMPORARY AUTHORITY TO PROVIDE
DOMESTIC SERVICE VIA TDRS-5 AT 62° W.L.**

Pursuant to Section 154(i) of the Communications Act of 1934, as amended, ARC Professional Services Group, Inc. ("ARC") hereby requests special temporary authority (an "STA") to operate the C-band transponders on the spacecraft TDRS-5 at 62° W.L. to provide fixed satellite service between points in the United States.

I. Introduction

NASA has developed a tracking and data relay satellite (TDRS) system to provide communications and data relay services between low earth-orbiting satellites and ground mission control and data-handling stations. The TDRS system operates on

government frequencies at S-band (2025-2300 MHz) and Ku-band (13,750-15,115 MHz).

The TDRS space segment is composed of three relay satellites in geostationary orbit. TDRS satellites located at 41° W.L. and 171° W.L. provide operational TDRS service. A third TDRS satellite, centrally positioned between the two spacecraft providing TDRS service, serves as an in-orbit spare for the TDRS system.

The TDRS satellites are designated by number (TDRS-1, TDRS-2, etc.). The numbering scheme for the TDRS satellites has recently been changed. The following table identifies each TDRS satellite by its current number, its former number, and its launch date and current location:

Table 1
TDRS SATELLITES

<u>New In-Flight (FCC) Number Designation for TDRS</u>	<u>Former In-flight (FCC) No.</u>	<u>Launch Date</u>	<u>Current Location</u>
1	1	April, 1983	Originally 41° W.L.; now at 79° W.L. as interim spare.
2	-	Jan., 1986	Lost with Challenger
3	2	Sept., 1988	171° W.L.
4	3	March, 1989	41° W.L.
5	4	(Jan., 1991)	62° W.L., replaces #1
6	5	(early 1990's)	171° W.L., to be co-located w/ TDRS #3
7	6	(early 1990's)	41° W.L., to be co-located w/ TDRS #4

Thus, TDRS-4 currently operates and provides TDRS service at 41° W.L. and TDRS-3 provides TDRS service from 171° W.L. TDRS-1, which was originally located at 41° W.L., has been relocated to 79° W.L. It serves as the current in-orbit spare for the TDRS system.

The next TDRS satellite to be launched will be TDRS-5. It is scheduled to be launched in January, 1991 and will be positioned at 62° W.L. At that time, TDRS-1 will be nearing the end of its useful life. TDRS-5 will replace TDRS-1 as the centrally positioned in-orbit spare satellite for the TDRS system.

In addition to operating on government frequencies to provide TDRS service, each of the TDRS satellites also contains twelve transponders which operate on commercial C-band frequencies (the 4/6 GHz band). Use of these C-band transponders for domestic service requires an authorization from the Federal Communications Commission ("FCC" or "Commission").

The purpose of ARC's instant request is to obtain an STA from the Commission which will permit ARC to use the C-band capacity on the TDRS-5 satellite at 62° W.L. to provide service to NASA. For the reasons presented hereafter, ARC is legally, financially, and technically qualified to receive an STA in this case, and it would be in the public interest for the Commission

to issue an STA to ARC.

II. Request for Temporary Authority

ARC is applying for special temporary authority to operate TDRS-5, a C-band satellite, on a non-common carrier basis to provide domestic fixed satellite service from 62° W.L.

ARC's address is:

ARC Professional Services Group, Inc.
585 Grove Street
Suite 300
Herndon, Virginia 22070

Inquiries and correspondence should be addressed to Mr. L. Roy Patterson at the above address, with a copy to Counsel for ARC:

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ARC will operate the C-band transponders on TDRS-5 as a private, non-common carrier. ARC's only customer will be NASA; ARC will not make the C-band transponder capacity available to the public generally. Thus, ARC will not be providing common