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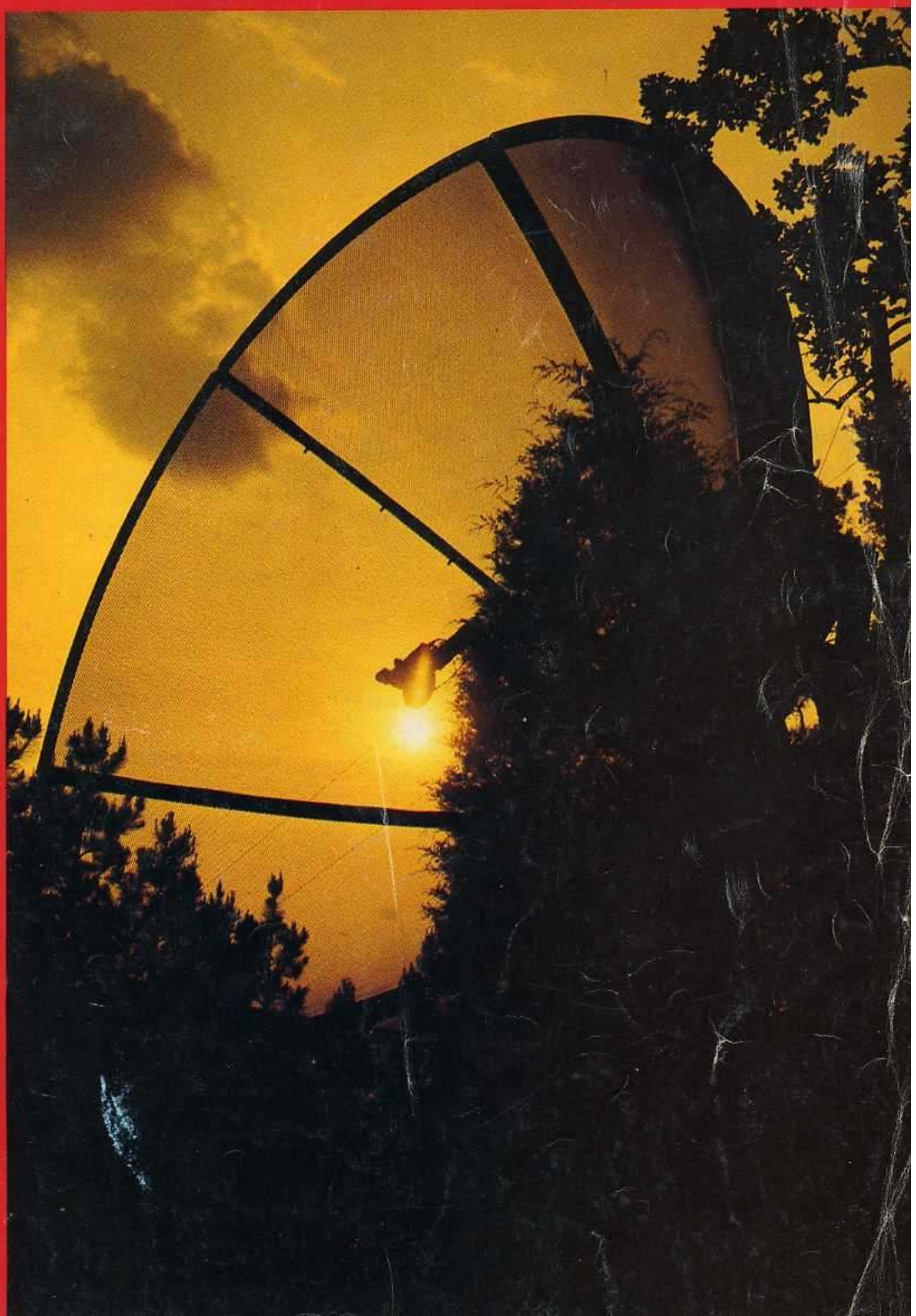

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OCTOBER 1983 VOLUME I, NUMBER 10

Satellite TV Magazine

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 Editorial and executive offices located at 501 N. Washington Street, Shelby, North Carolina 28150. Telephone - 1 (704) 482-9673.

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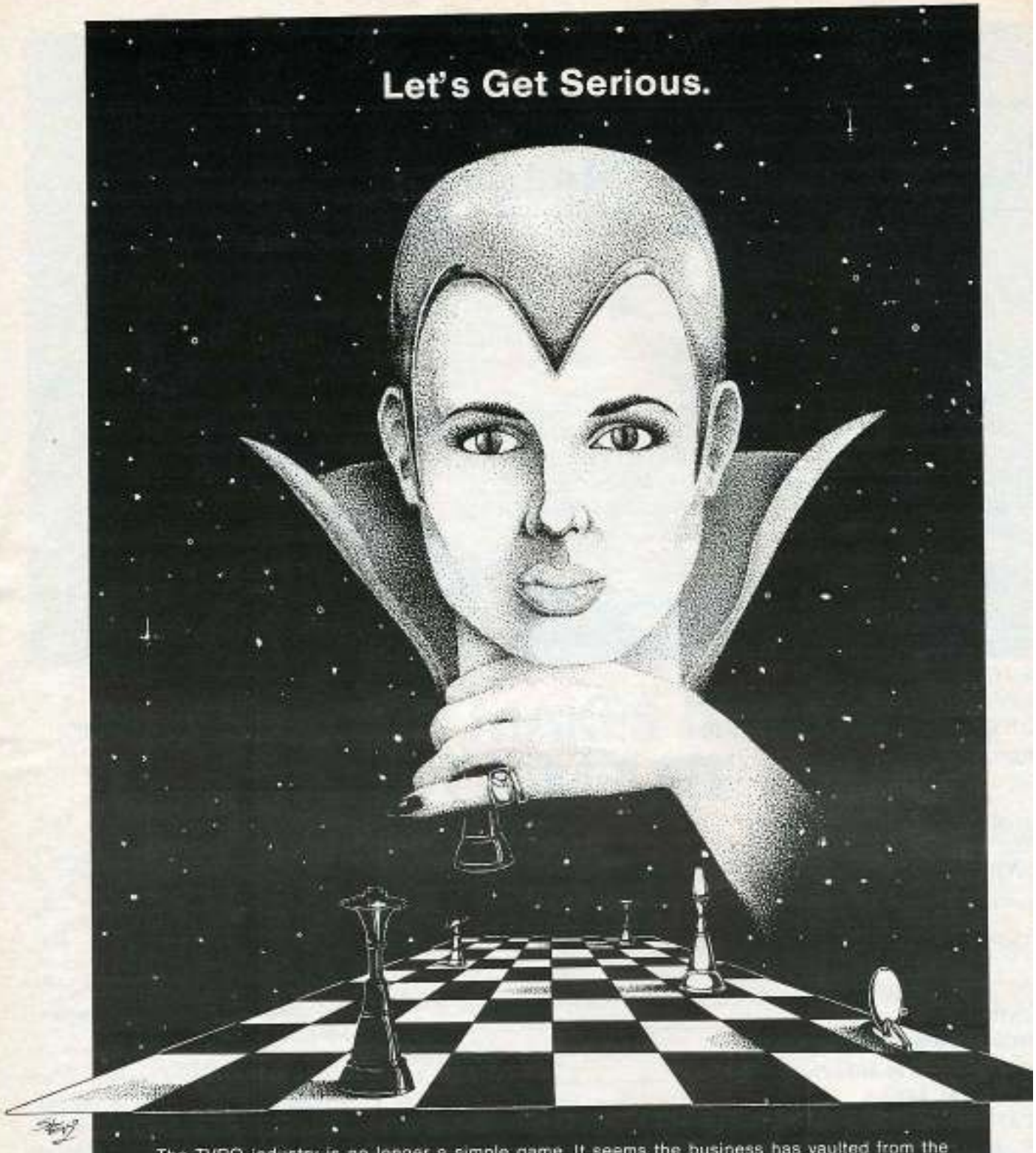
About Our Cover: Photo of the new JENSEN antenna by Bill Pace, compliments to Jean Beaty of JENSEN. This is a deep (F/D .3) 12' mesh antenna recently introduced by this Racine, Wisconsin firm. For more information on this antenna turn to page 9.



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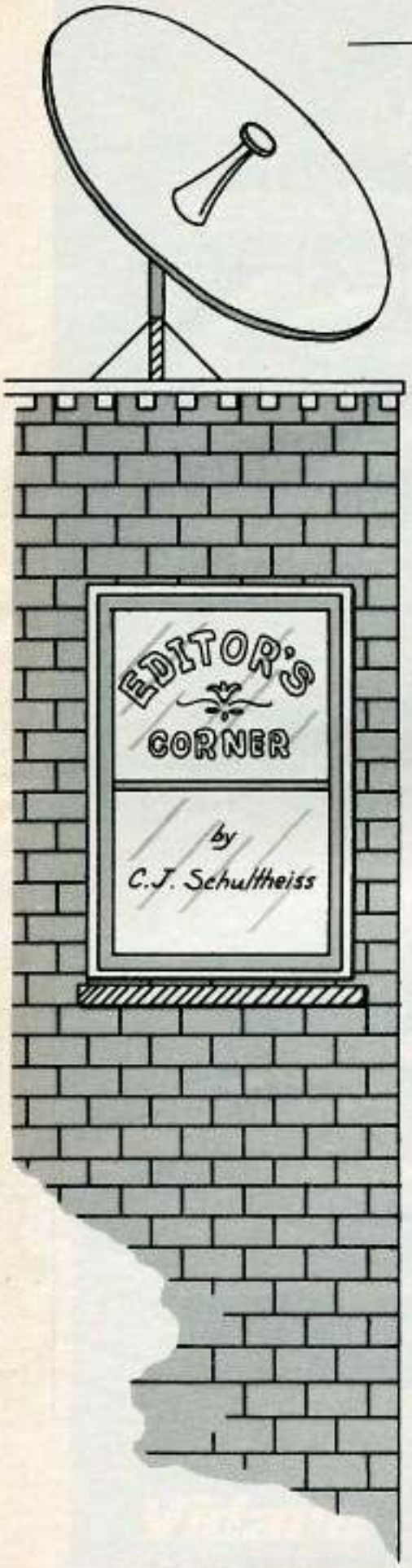


Editor's Corner

By C.J. Schultheiss

One of the hottest and most controversial subjects that has been addressed between the covers of this magazine is the scrambling issue. We have tried to deal with this subject in an objective and straightforward manner, but apparently we have failed.

An avalanche of mail has been received from manufacturers, dealers, consumers and programmers. Even the local dogcatcher has gotten into the act. (I'll save that story for another time.)

Our editorial position is simple and straightforward - yes, some channels will be scrambled in addition to ON-TV, CAN-COM, and Blue Max - **however many, many more will not be scrambled!** The programmers that do eventually scramble will inevitably make descramblers available to private terminal owners simply because they cannot ignore the potential revenue from hundreds of thousands of new customers. There are a myriad of problems to be solved, such as standardization and interchangeability of descramblers, distribution and marketing of both the hardware and the software, and overcoming the pressure of the cable companies who think they and they alone have a divine right to the distribution of programming.

STV Magazine does not specifically wish to appear as an advocate of black market descramblers. However, if programmers do not address the private terminal market in the near future, there is no doubt that the sale of non-authorized descramblers will proliferate. Oak Orion and Blue Max have taken a step in the right direction by offering to sell the Oak Orion Descrambler and an annual subscription to private terminal owners. Unfortunately at $1800.00 for the descrambler and $350.00 for an annual subscription, it is probably not going to set the world on fire.

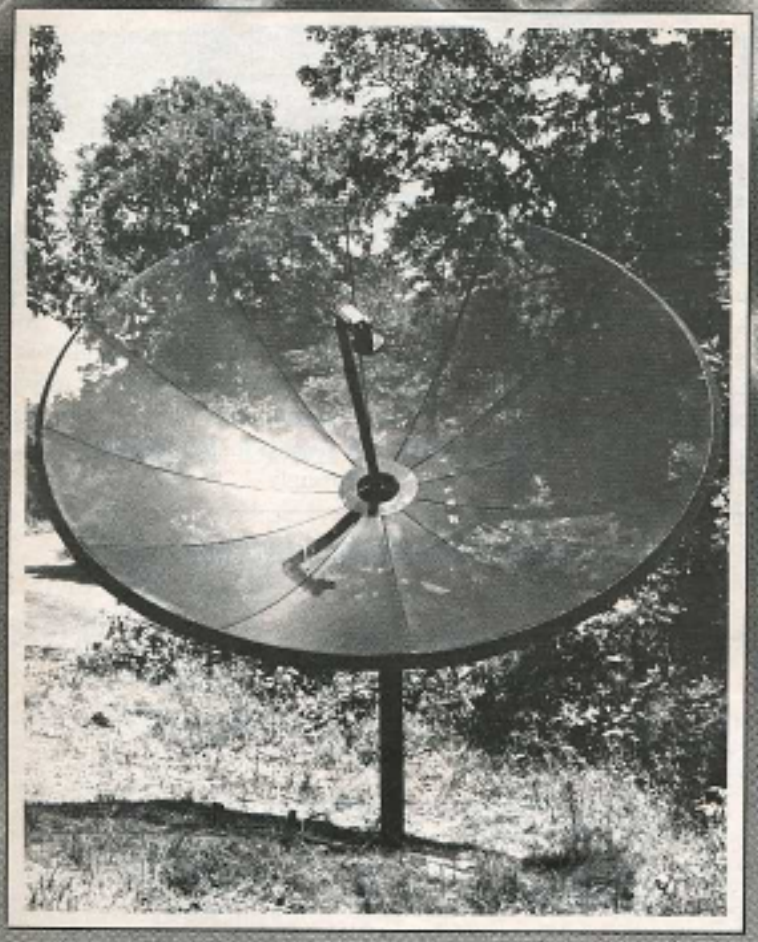
Several dealers have complained vociferously that the scrambling editorials in this magazine have "scared off" a few potential customers - I am sorry if this is the case - but at no time did we sensationalize or over-dramatize the issue. In all good conscience the subject of scrambling must be addressed and we will attempt to keep you up to date as new developments occur.

In the past six weeks, I have taken the time to get out and visit many different areas of the country to tour many of the major manufacturers and distributors in the industry. My travels have taken me to the West Coast where we visited Chaparral, Dexcel, Avantek, KLM, Amplica, Janeil and California Amplifier. Further east, I was able to spend some time visiting M/A-Com's numerous facilities stretching from North Carolina to Fort Wayne, Indiana, including Burlington, Massachusetts, and Toronto, Canada. I came away most impressed with the commitment and investment that each of these companies have made to this industry. In between these visits, I combined a little business and pleasure, and drove from North Carolina up the East Coast through Virginia, West Virginia, Maryland, Pennsylvania, New York, Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward Island. I apologize if this sounds like a travelogue, but I wish to point out the diversity of the places I visited. The total round trip was in excess of 4,000 miles and I was excited whenever I came across a TVRO system, but then it occurred to me how many homes in obviously underserved rural areas (I was lucky to find one FM radio station on the car radio) have yet to be sold on the value of a satellite terminal.

It brought to mind a little anecdote told by Thomas Bata, of Bata Shoes, who has manufacturing plants all over the world. Bata once sent two representatives to a middle eastern country (mostly desert) to study the feasability of building a shoe factory. One representative telegrammed Bata with a cryptic message - "Forget shoe factory - nobody wears shoes in this country" while the second representative sent an equally cryptic message - "Great place for a shoe factory -nobody has shoes in this country".

Until next time,

Something Special...



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Listening In

By David Day

"The Tale of The Tape" .....

The summer months are not the best time to monitor television programming with repeats of re-runs and old Reagan movies. But the HBO coverage of Wimbledon was well up to standard with the might of NBC taking over from the semi-finals onwards on COMSTAR D 3, Transponder 1 - No **not** Transponder 24 "Channel Guide"! While tuned to NBC following Wimbledon coverage, it occured to me that network television was much better by Satellite than I had remembered, but the promise of one of those superb NBC Tour Jackets with the embroidered peacock by Guy E. Davis Sr. of The House Of Aztec, Huntington Beach, does help somewhat. He is one of the gentlemen of our industry and many of you will know his son also, Guy C. Davis, V.P. Sales of INTERSAT and a welcome regular speaker at seminars.

Wisely foresaking the TV screen until Fall, but still in keeping with the title of this column 'Listening In': the industry seminars have provided some very rewarding listening. It is rightfully claimed here, that you the reader shall be told it "like it is". You deserve the factual truth and writers should recognize this serious responsibility they owe to their readers. Our's is much the same responsibility as that of the Disciples recording early biblical history, as we chronicle the pioneer days of our youthful TVRO industry.

This writer was most concerned to hear Dr. Taylor Howard say at CAN/AM recently, "There is an article I have read - it was a transcription of a talk I did at Boulder or Denver. It is the worst single thing I have ever read. I didn't know I talked like that".

Dr. Taylor Howard's reputation as one of our leading authorities and speakers is without question. That article he referred to appeared in "Channel Guide" June 26-July 2, 1983, Volume 3, Number 22. Although space does not allow a full comparison, here are some of the major differences between what Dr. Howard said and what "Channel Guide" reported so wrongly .....

This is what "Channel Guide" reported:	&	**This is what Dr. Taylor Howard really said:**
"It's a little confusing because it has 12 and 14 GHz **next**"	=	"It's a little confusing because it has 12 and 14 GHz **mixed**"
(Dr. Howard's reference to the Seminar book published by "Channel Guide" themselves - yet another example of confused thinking on their part but read on, for the next quote is an all time classic.)		
"Therefore the higher the carriage - the ratio the better picture you get over some weather"	=	"Therefore the higher the carrier to noise ratio the better picture you get over some limit"
"..... signal the noise ratio" (Early Roman command?)	=	"..... signal to noise ratio"
"..... it isn't just driven by the carriage of noise ratio .... between the uplink in the Satellites ..... with casgrain feeds ..... lower rated low noise amplifiers". (Followed by more schoolboy howlers line after line!)	=	"..... it isn't just driven by the carrier to noise ratio .... between the uplink and the Satellites ..... with Cassegrain Feeds ..... before we had Low Noise Amplifiers".

Research reference sources:-
"Channel Guide" June 26-July 2, 1983.
"Fundamentals of Private Cable" 1983 Sat Expo Co. Page 24
Dr. Taylor Howard talks at both Denver Sat-Expo '83 and S.T.T.I. CAN/AM '83 Minneapolis recorded by "Conference Cassettes".

Continued on page 109

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And Now, A Few Words About ...

By Mike Gustafson

RCA Communications seems to be having more than their share of problems. As you may remember, RCA lost a rather major satellite called F-3 a few years back. That's why the next RCA satellite was called F-3r, "r" for replacement. Then during the month of April of this year, they lost all the horizontal transponders on Satcom F-2. They have put in a 20 million dollar insurance claim for that loss. How would you like to see their insurance premium next year?

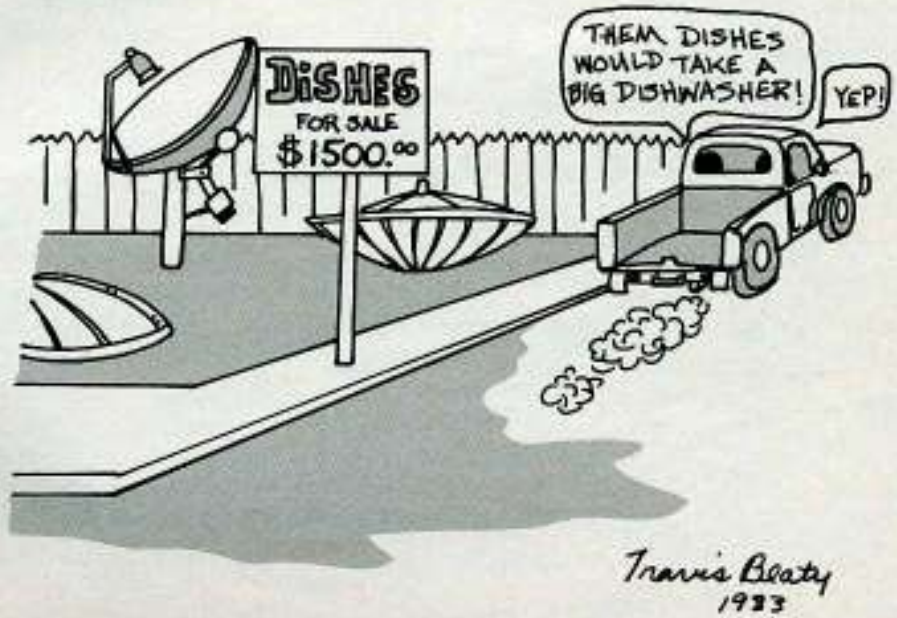
RCA's troubles are still not over. On July 6 of this year, their brand new bird Satcom F-1r went into a roll mode during normal station keeping maneuvers. What this really means is they lost control of the bird for some period of time. The satellite was loaded up with data and phone traffic at the time of attitude control failure. This traffic was switched over to other satellites for awhile until RCA figured out what was up with their new satellite. The satellite was turned off and allowed to cool down before testing was started to try to find the problem. About a week later I noticed that it was turned back on, so they must have figured out what the problem was.

If RCA were to lose this new bird, they could have a tough time finding anyone to buy space on their new satellites. Hughes Communications already supplies 70% of the world's communications satellites, and with all these failures, RCA might find themselves with a lot of empty transponders as users move over to Westar or Galaxy.

Speaking of Galaxy, as you read this, Galaxy (G-1) should be full of video and putting in a strong signal all over the country. Based on reports I have been getting, G-1 transponder's output power is the highest of any U.S. domestic C-band satellite yet launched. RCA (Satcom) transponders use 5.0 watts or 8.5 watts, Westar uses 7.5 watts, and Galaxy runs 9.0 watts. As I write this piece in July, I am seeing test signals on G-1 in its final orbit position at 134 degrees West. Judging by the amount of power I see, you should be able to see the signals without an antenna! Just hold your LNA out the window and there it will be. For you brave souls out there, you can probably get usable pictures off a 4 foot dish on G-1. Stand by for more hype about the new receiver technology "break throughs" by using a 4 foot dish. Like P.T. Barnum said, "There's a sucker born every minute". Don't you be one of them!

After January 2 of 1984, it will get harder and harder to watch some of the network programming on your satellite system. This is because N.B.C. has entered into a hundred million dollar contract with Comsat General, a division of Comsat, to start installing Ku-band uplinks and downlinks for all of N.B.C.'s affiliates. At first there will be two main uplinks, one in New York and the other in beautiful downtown Burbank. There will also be three transportable up/downlinks to be used by N.B.C. for sporting events. There go the football games without commercials! This contract will be for ten years and will start with just 24 affiliate stations. This gives N.B.C. the honor of being the first network to distribute programming via Ku-band satellites. After they have worked out all the problems, and there are lots of them, the other networks will be looking hard at this new distribution system. Don't run out and slap a For Sale sign on your system just yet, they will be simulcasting on both bands for many years to come.

★ ★ ★



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SPACE

Terrestrial Links

ISLAND PUBLISHER MARKETING TVRO's It is rumored that a TVRO dealership has opened up in the islands. A rather unique marketing theme has apparently been adopted. TVRO equipment is solicited from manufacturers and distributors at no cost - ostensibly for testing and evaluation in a small well known trade publication - then the guru publisher does some sleight-of-hand and becomes a TVRO dealer selling the systems to local residents. The profit margin is excellent but the ethics dubious. Several companies who have participated in this "surprise give-away" have expressed thier displeasure and do not plan to contribute further to his high profit scheme!

FEED AMALGAMATION - You can expect to see a solid state "Polarotor™" from Chaparral in the near future. Reportedly, our friend from the LA area who is credited with the first consumer ferrite polarization device has signed an agreement with the number 1 feed manufacturer.

NASDA DEFUNCT - Lack of support and a conflict of interest has forced the "dealer association" to shut down operations after a few short months of operation. The ex-members are probably wondering if their membership fees will be refunded.

SAN JOSE SATEXPO CANCELLED - The plans for a fall show have been cancelled. Andy Gibbs announced that Channel Guides decision not to participate forced the cancellation. Mr. Gibbs was apparently not pleased with the last minute withdrawal by Channel Guide.

GALVIN/ISV DIVORCE - Rich Galvin and International Satellite Video have parted company. Rich has been seen running back and forth to Las Vegas with his briefcase and he is either frequenting the blackjack tables or consulting with a Vegas TVRO company.

CANADIAN MTV - Rumors of a Canadian Music Channel have hit the street. It is reported that eight companies are vying for CRTC approval.

PUBLIC LNA's - There is a rumor that a privately held West Coast LNA manufacturer may be planning to go public. The company has been doing very well and has managed to grab a good marketshare which should make an attractive offering to investors.

TRANSTAR EXPANDS - Tommy Tow and Transtar Communication of Franklin Tennessee have moved into new facilities. The 10,000 square foot facility is located at 1108 Harpath Industrial Court in Franklin.

NEWTON LOSES STOVER - John Stover formerly with Newton Electronics has left the California electronics firm to start his own marketing consultant company to be called Hi-Q Marketing. Stover will also publish a marketing newsletter to be introduced this fall.

SPACE AGE TIMES - This bimonthly publication is the "voice" of the United States Space Education Association which is a non profit organization dedicated to providing information and news about space exploration to its members. Annual membership is very reasonable and a must for space buffs. Contact USSEA at 746 Turnpike Rd., Elizabethtown, PA 17022. Telephone (717) 367-3265.

The Canadian Scene

By Bill Barr

The Canadian Football League got up to some funny business last week on Thursday July 15th. A home game with the Toronto Argonauts was subject to local blackout rules, which up until now would mean the local taverns would be full due to the network feed being on Anik B satellite.

Lots of satellite sales were made in order to cash in on this business with lots pending. Then the boom dropped! At 8:00 pm the dishes were scanning the Clark Belt, the phone lines were buzzing; there was no game on the network.

As I was at the game in the press box, I thought I'd do some asking. No one was talking. We had some indication of what may come down last year. C.T.V., one of the networks carrying these games, sent out a directive for their affiliates to line up earth-bound terrestrial linkage to get the feed, but C.B.C., the carrier for this particular game, had always used Anik B, Transponder 11 (22 on the 24 CH format).

A postmortem, conducted by me the next morning, revealed many local taverns closed their doors 2 hours prior to game time and customers were in a festive mood. But at 8:05 pm, they were riotous after being forced to listen to the game on the radio. As sports fans will go to great extremes to see their team, I started digging around and solved the problem when I located a friend who watched the game on Anik C3. This is the 12 GHz bird which carries Pay TV in Canada. The disturbing thing about it is that it has 4 spot beams, meaning that different channels can be carried in different parts of the country with little overlap. If they moved a Toronto game to the east, west, or center west beam, Ontario residents could not receive the signal even if they had the equipment. The league would then have the added cost of microwave delivery for local coverage. By local, I mean 1,000 miles in diameter.

What Mr. Gadar (Canadian Football League Commissioner) and his friends are unaware of, is that for the cost of a dual feed, 12 GHz L.N.B.C. and receiver, these taverns are back in business. Some firms propose to rent this equipment as standby for the next game. Failing that, this writer knows how the carrier gets its feed from the stadium into the trunk and that this is in the general direction of many taverns so some of them will invest in steel snow slides soon.

Wouldn't it be nice if the C.F.L. had a director who had an eye for business and worked out an entrance fee with the hotel association, and everyone would be happy and rich. I should mention that there were very few empty seats in the stands. The attendance exceeded 39,000. Not bad considering the temperature was 95° at 10:00 pm.

Many tavern owners telephone to ask how they can tell if the game is on or not. The quick answer is they can not, although they can shorten their odds. The first thing to do is check your guide and if it is on E.S.P.N. which carries Canadian Football you can be 100% certain it is on Channel 7, Satcom 3 as E.S.P.N. uses satellite delivery exclusively in the U.S. and cannot resort to microwave. The second thing to do is go by the stadium a few days prior to the game and as TV stations love to advertise on their cameras, check the logo.

If the C.B.C. is carryng the game, invest in a 12 GHz upgrade. If the C.T.V. is broadcasting, keep listening in on this corner for ways around the blackout because local fans are fanatic about their team, and will go to great extremes in order to avoid the crowds in the stands.

Congratulations to Drake. They now have their E.S.R. 24 receiver C.S.A. and U.L. approved. Many hydro officials in Canada are now insisting on a hydro inspection of all equipment used that is not approved. Luxor comes with a hydro sticker, but lots of other manufacturers are oblivious to the underwrites laboratory.

It is important to note that insurance agents will tell you that if a fire results due to malfunction of equipment, and a claim is filed, they will disclaim it if it does not bear C.S.A. or U.L. listing. All receiver manufacturers that intend being around for awhile, please submit your equipment for approval and save people the aggravation.

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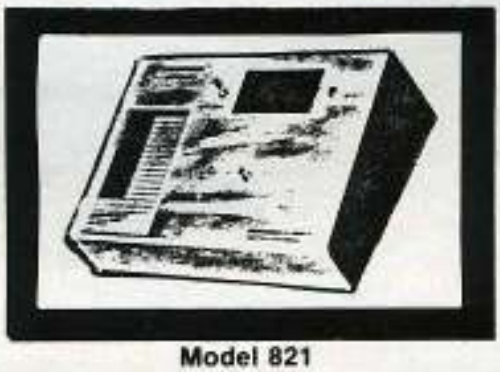
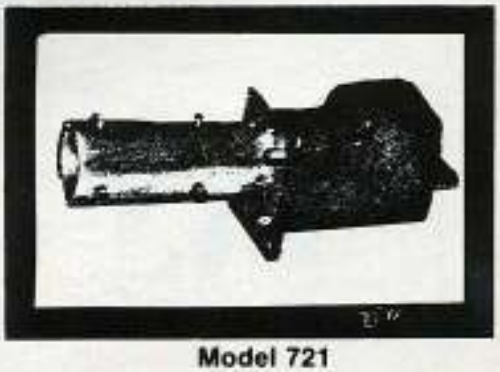


Model 821



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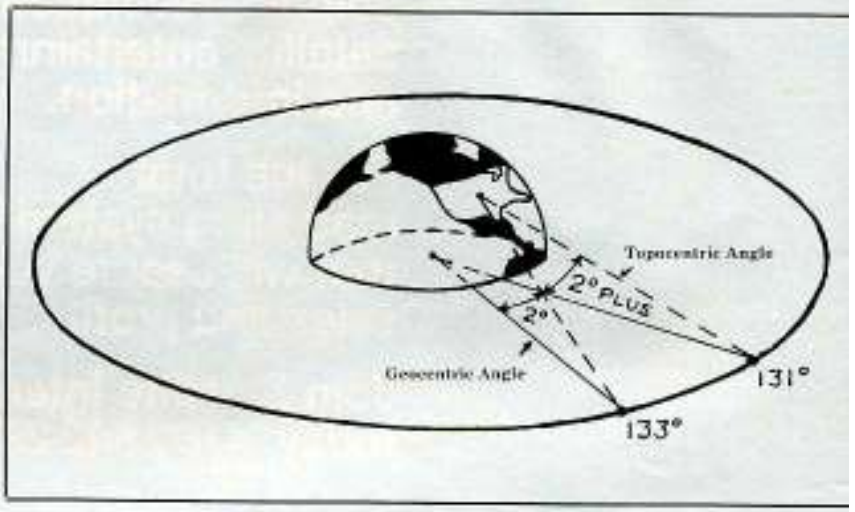
Is 2° Really 2°?

By Charles Schreiner and Martin Manley

to-po-cen-tric */adj/* relating to, measured from or as if observed from a particular point on the earth's surface.

geo-cen-tric */adj/* relating to, measured from or as if observed from a particular point at the earth's center.

After listening to several differing views, we decided to investigate for ourselves to find out how the angle between two satellites changes relative to one's position on the surface of the earth.



The angle associated with Satcom 3, for example, is 131°. This means that Satcom 3 is directly above the equator at 131° longitude. If a line were drawn from Satcom 3 to the center of the earth and another line were drawn from a hypothetical satellite at 133° longitude to the center of the earth, the angle formed would be 2°. However, on the surface of the earth, the angle between two satellites is affected by not only one's location, but also how far east or west the two satellites are.

The following chart represents the results of a computer program written to determine the angle between any two satellites at various locations in the United States.

	81° - 83°	105° - 107°	131° - 133°
Tacoma, Washington	2.14°	2.20°	2.21°
Goose Lake, California	2.17°	2.23°	2.23°
Santa Monica, California	2.20°	2.27°	2.26°
Grand Forks, North Dakota	2.20°	2.20°	2.16°
Topeka, Kansas	2.24°	2.25°	2.19°
Corpus Christi, Texas	2.29°	2.30°	2.23°
Bangor, Maine	2.21°	2.16°	2.07°
Raleigh, North Carolina	2.27°	2.22°	2.12°
Key West, Florida	2.31°	2.27°	2.16°
Honolulu, Hawaii	2.03°	2.15°	2.27°
Anchorage, Alaska	2.03°	2.09°	2.13°

Perhaps the most surprising aspect of the chart is that regardless of the location in the United States, including Alaska and Hawaii, that 2° spacing of satellites would in reality be greater than 2°. Also, the chart indicates an amazing consistency in the angles of ± .18° from the average of 2.21°. This is due to the great distances the satellites are from Earth.

Another use for this research was to find out how far a dish must pivot by 1990 in order to receive Satcom 5 at 143° and also to receive a Satcom bird at 67°. At this time it requires only 55° of dish rotation on the polar axis to go from F3 to F4. However, in a mere seven years, we will need 86° of motion. Simply put, this means that manufacturers of mounts and actuators must consider the future needs of TVRO buyers.

This is how the results were obtained for those readers who are mathematically inclined. To begin with, one identifies various satellites and locations using spherical coordinates. Next, the spherical coordinates are converted into rectangular coordinates.

$x = p\ (\sin\phi\ \cos\theta)$
$y = p\ (\sin\phi\ \sin\theta)$
$z = \cdot\ (\cos\phi)$
p = distance from the center of the earth.
$\phi = (90° - \text{latitude})$
θ = longitude

Using the distance formula, one can then compute the distance between any two satellites as well as between a satellite and a point on the earth.

$$D = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

Finally, using those distances, one can form a triangle with two satellites and a point on the earth as the vertices. Now, the Law of Cosines will yield the angle of interest.

$$a = \text{Cos}^{-1}\left[\frac{B^2 + C^2 - A^2}{2BC}\right]$$

Anyone who desires a copy of the computer program written in Basic language, can send to the following address.

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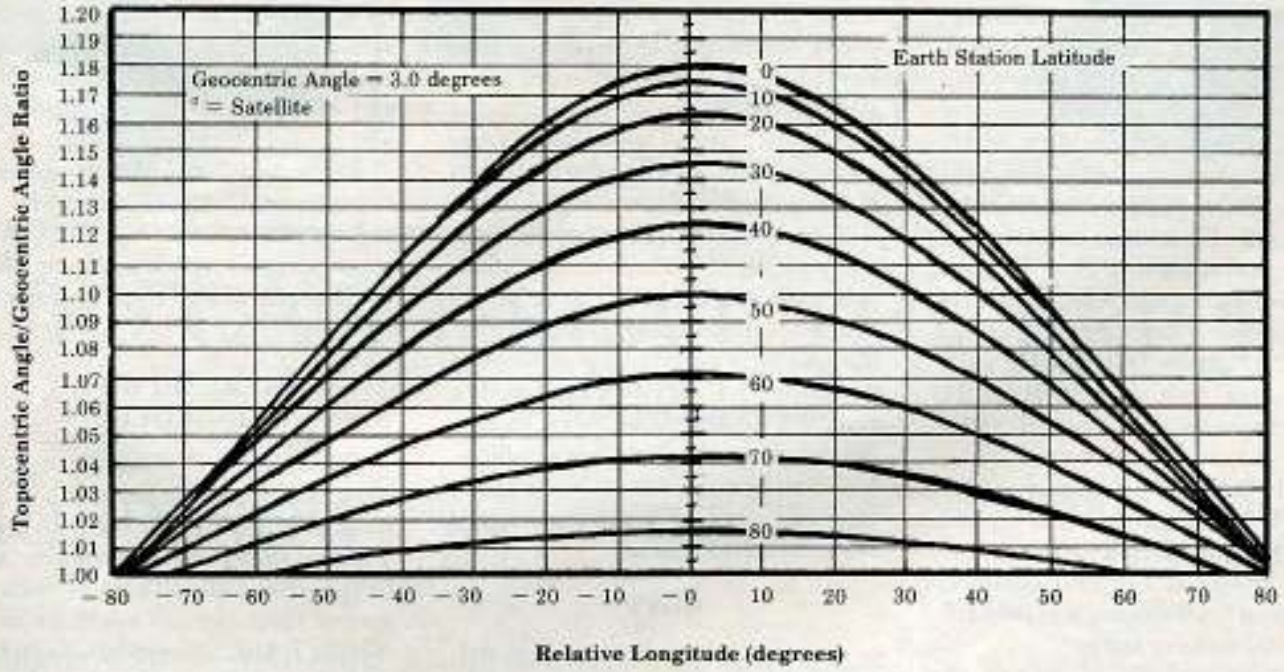
EVALUATION OF TOPOCENTRIC VS. GEOCENTRIC ANGLES



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RARC'S OVER AND DBS IS READY TO FLY

By Stan Prentiss

The 1983 Regional Administrative Radio Conference in Geneva, Switzerland has now met and adjourned, with the U.S. getting better than half the cake, but not quite the multi-meal mix it wanted.

A satellite hanging over Brazil's Sugar Loaf Mountain at 61.7° West longitude, and subject to 72 minutes of eclipse outages during March 21 and September 23 equinoxes, isn't exciting. Nor is a power flux density of −107 dB/meter^2 instead of −105 dB/meter^2 a rave item. But until the night before this meeting ultimately ended, there was no final agreement on anything, and it wasn't until the U.S. and Canada combined to push and shove a little, that the compromise became possible.

Now, according to U.S. delegation Federal Communications Commission engineer Bruno Pattan, we do have 32 channels assigned for each service area with passbands of 24 MHz, channel separations of 14.58 MHz, eight orbital positions at 157°, 148°, 119°, 110°, 101° that are satisfactory and three at 166°, 175°, and 61.7° that are somewhat questionable. The one at 175°, for instance, will have an elevation angle of only 10° for several western states.

POLARIZATIONS

Occupying a downlink between 12.2 and 12.7 GHz and an uplink from 17.3 to 17.8 GHz, downlinks within two contiguous areas require opposite sense right or left hand circular polarization for adjacent transponders. Uplink characteristics, however, are to be decided by individual countries and may be either circular or linear, but not both, depending on area coverage and/or technology. In case you're confused over power flux density (PFD), this is derived from PFD = EIRP − 163 dB (for any area), with the −163 dB figure originating from spreading factor 10 log $4/\pi R^2$, where R is the slant range.

Service area separations are generally set at 10°. Three or four channels may be supplied by a single satellite, and as many as eight satellites can form a cluster in positions not closer than 0.4°. If you'd like a usable equation to determine more or less precise separation between satellites, Mr. Pattan suggests; S = R (slant range to satellite) times the angular separation (in radians).

HDTV

Naturally, the subject of high definition television was on the minds of the delegates, and our U.S. group seems to be thinking more of Britain's MAC (Aug. issue of Sat. TV Mag.) and also of brute-forcing pure HDTV via the Sony/Panasonic/CBS route. This would require strapping a pair of 24 MHz channels together and developing totally new wideband sets for the receive task. On the other hand, time division multiplexing of chroma and luminance within either MAC or RCA's new NTSC-compatible system would aid the cause substantially and requre only normal DBS bandwidth and standard transponder processing.

Regardless, bet your bottom dollar on domestic digital television receivers next year from two or more manufacturers who are already using ITT's sophisticated chips in projected systems.

WHERE DO WE GO FROM HERE

Of the eight DBS applicants who have thus far been approved by the FCC: STC, RCA, DBSC, WU, CBS, USSB, Video Sat. Systems, and Graphic Scan, all will have to re-file or amend their original applications to include RARC agreements, including satellite locations and technical parameters. If you'd like an educated guess, possibly only four of this group may actually launch due to the enormous expense involved.

★ ★ ★

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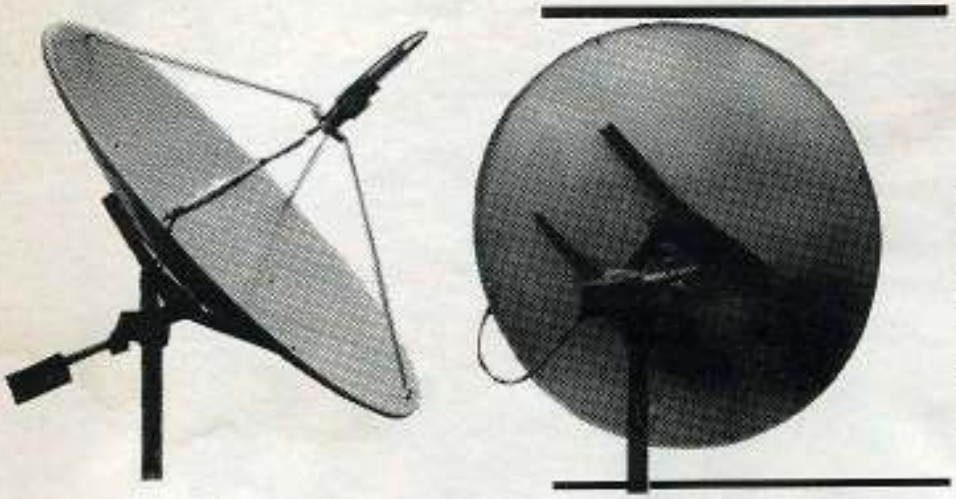

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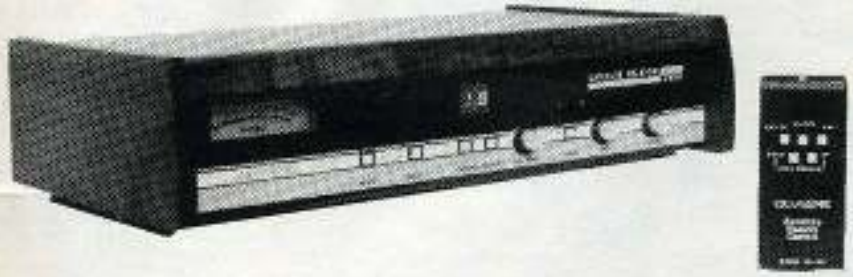

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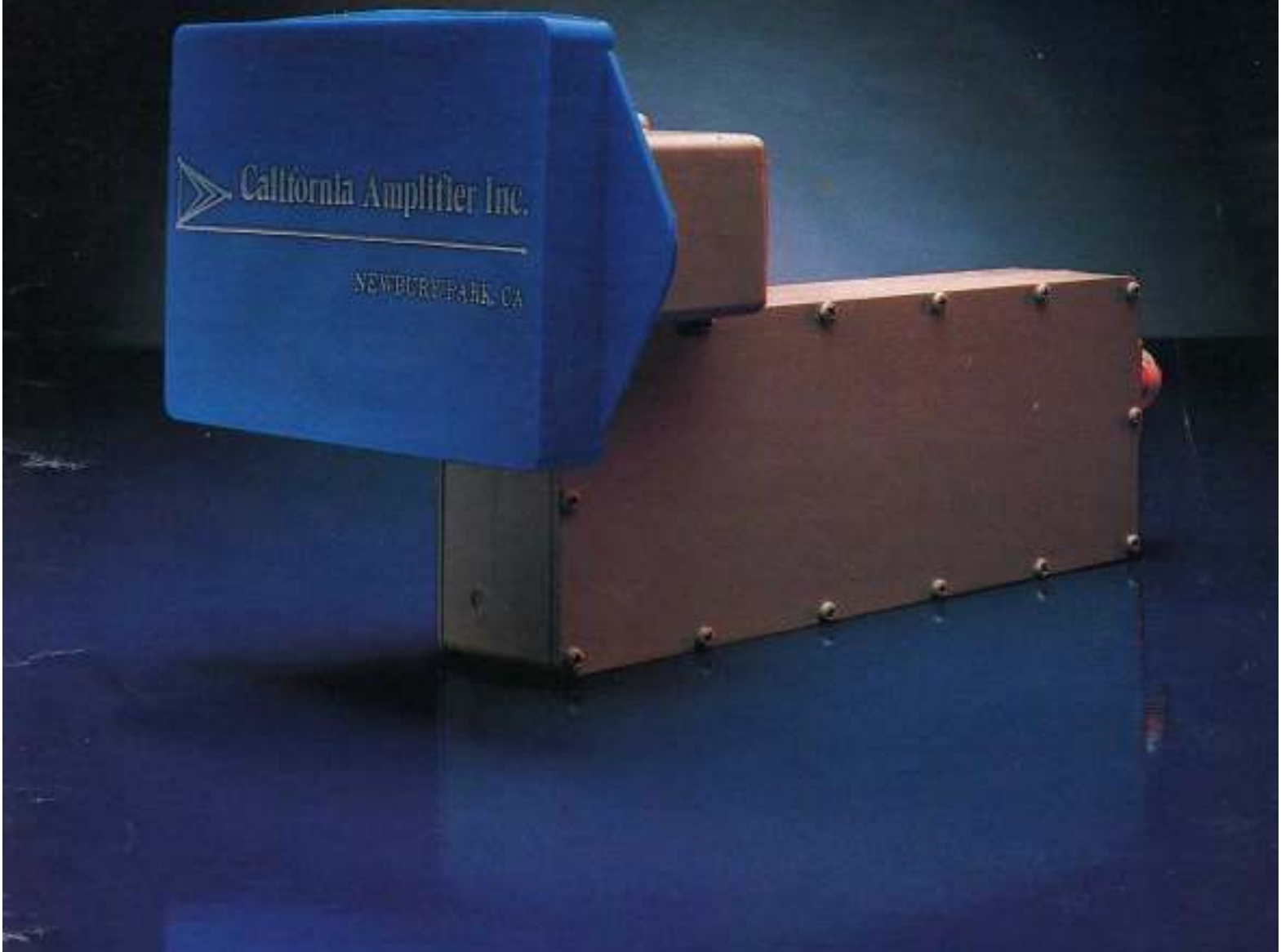

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News

The seventh Space Shuttle mission is now over, and NASA officials are calling it the "most successful" in light of it's complexity. The major disappointment with the flight came when dense clouds forced the cancellation of the first landing at Kennedy.

The most significant aspect of STS-7 was, of course, the presence of Dr. Sally K. Ride, The first American female in space.

Tests involving the Canadian-built arm went extremely well as did the deployment of the Indonesian, Canadian and West German satellites.

The eighth Space Shuttle mission is scheduled for August 21, but may suffer delays due to problems in checking out the TDRSS Satellite.

The TDRSS (Tracking and Data Relay Satellite System) was deployed from the Space Shuttle Challenger on April 4, 1983. The TDRSS Satellite began to have problems when a failure occurred while its Inertial Upper Stage (IVS) booster rocket was attempting to propel the spacecraft into geosynchronous orbit.

After some 58 days of delicate maneuvers a NASA team of engineers finally succeeded in placing the spacecraft in orbit 22,236 statute miles above the equator, using the tiny station keeping one-pound thrusters to boost the 5,000 pound spacecraft the extra 8,662 miles required.

TDRSS is scheduled to make tests with the STS-8 Space Shuttle mission, and will also be used with the STS-9 mission scheduled for late September.

STS-9 will also carry the Spacelab payload, the European Space Agency's orbiting research laboratory.

Indonesia's Satellite Palapa B-1 is now on station at 108° east longitude in geosynchronous orbit 22,300 miles above the equator. Palapa B-1 was launched from STS-7, and is the first of two second generation communications devices serving the Jakarta government's expanding telephone, telex, and television operations. Palapa B-1 replaced the two Palapa A devices orbited in 1976.

The Palapa systems consists of the two orbiting communications satellites and over 120 ground stations which

News

link the far-flung islands of a country more than three thousand miles from east to west. The network aims not only at improving telephone and telex links for business, but also for expanding educational television among diverse population groups.

The Palapa satellites were designed by Hughes Aircraft and have a life expectancy of eight years. They are twice the size and power of the first generation Palapa A series and have 24 transponders.

Satellite communications are an integral part and a unifying factor among the 13,700 islands of Indonesia. Besides serving Indonesia, the new satellites will play an important communications role in some states of the Association of Southeast Asian Nations (ASEAN).

M/A-Com to design IAST DBS System. According to Inter American Satellite T.V. (IAST), Pres. William Kommers, M/A-Com will be "system design consultants and will procure the equipment" for their entire interim DBS system. M/A-Com was chosen because of its leadership in manufacturing dishes and other satellite system equipment, according to Kommers. In a written statement released by IAST, Rupert Murdoch stated that the choice of the company to handle system design was a "major step toward making reliable, low cost ground equipment readily available to subscribers."

General Instrument recently received an estimated $600 million dollars to provide similar service for another early-entrant DBS company, United Satellite Communications, Inc. (USCI). The amount M/A-Com will receive has not been disclosed. Although General Instrument is in charge of procuring and distributing the system for USCI, the same M/A-Com equipment as in the IAST system will be used.

Britain. British Telecom International has announced plans to build London's first satellite earth station. The system will have two 13 meter dishes located at N. Woolwich, in the heart of the city's dockland. The earth station should be ready sometime in 1984 and will operate to the European Communications Satellite and to an Intelsat bird.

Continued on page 95

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DIRECT BROADCAST SATELLITES
— Interesting Times Ahead!

by Andrew F. Inglis

The following article is based on a speech given during the Annual Meeting of the American Institute of Astronautics and Aeronautics, Los Angeles, May 10-12, 1983.

DBS is one of the most exciting developments in the already exciting history of communications satellites. The concept of receiving a signal directly from a satellite by a small antenna mounted on one's roof has caught the public's fancy, and this has created an intense interest in the subject which is reflected not only in the trade press but in the general press as well. The technical, regulatory, and economic issues which are faced by this new service are great, however, and it is my purpose to describe not only its opportunities and promises, but also its problems.

Types of Satellites

The FCC has authorized three classes of commercial communications satellites which differ in their position in the spectrum and their operating power. They are usually described as "C-band," "K-band," and DBS. The basic features of these classes are shown in Figure 1.

Figure 1

COMMERCIAL SATELLITES

	C-BAND	K-BAND	DBS
DOWNLINK FREQUENCY (GHz)	3.7-4.2	11.7-12.2	12.2-12.7
POWER (WATTS)	5 to 8	20 to 40	100 to 250
ANNUAL LEASE ($ MILLION/TRANSPONDER)	1.5	3.6	10 to 15
RECEIVING ANTENNA SIZE (METERS)	5 to 15	1 to 5	0.4 to 1

Most of the communications satellites now in operation in the United States are C-band. The downlink signals from the satellite are in the range of 3.7 to 4.2 Gigahertz (billions of cycles per second), and they operate with comparatively low output power - 5 to 8 watts. A typical annual lease rate for a "protected" transponder, i.e., one which is provided with a back-up transponder which can be used in the event of its failure, is $1.6-1.8 million, per year.

The next class is K-band. These satellites, which are just coming into use in the United States, operate at a much higher downlink frequency - 11.7 to 12.2 Gigahertz - and with higher power - 20 to 40 watts. Protected transponders on 40 watt K-band satellites will lease for about $3.6 million per year.

Finally, there is DBS, the subject of this presentation. These will operate with downlinks just above K-band satellites in the spectrum, from 12.2 to 12.7 Gigahertz. (For the purists in the audience, I should point out that the spectrum location of DBS is also in the K-band.) These will operate at an even higher power - from 100 to 250 watts. The cost of these satellites will be very high, and it is estimated that protected transponders will lease for $10 to $15 million per year.

The bottom line in Figure 1 shows the effect of satellite power on receiving antenna size - the higher the power, the smaller and cheaper the antenna. Thus, there is a basic trade-off between satellite power and cost on the one hand and receiving antenna size and cost on the other. The optimum combination depends on the number of receivers - the larger the number, the more economic it becomes to increase the power and cost of the satellite.

For distributing programs to a few thousand cable TV systems, C-band is the most cost effective.

For distributing programs to apartment buildings, a service called SMATV, receivers will be numbered in the tens of thousands, and K-band will be the most economic.

Finally, as we shall see later, DBS becomes cost effective only if the receivers are numbered in the millions.

DBS System Configuration

The satellite is the basic building block of a DBS system. Figure 2 shows the specifications which are typical of the satellites which have been authorized by the FCC.

Figure 2

DIRECT BROADCAST SATELLITE SPECIFICATIONS

• NUMBER OF CHANNELS	3 to 6
• BANDWIDTH	16 to 27 MHz
• POLARIZATION	PROBABLY CIRCULAR
• WEIGHT	4600 lbs.
• LIFE	7 yrs.
• LAUNCH VEHICLE	SHUTTLE
• COST (6 CHANNELS IN ORBIT)	$125 MILLION

The number of transponders or channels per satellite varies from 3 to 6. This compares with 24 transponders in most C-band satellites. The number of transponders in the higher power DBS satellites is limited because of constraints on weight and power availability. Needless to say, this is one of the factors which increases the cost of DBS.

Most C-band transponders employ 36 Megahertz channels. DBS applicants have specified narrower bandwidths ranging from 16 to 27 Megahertz. This provides the potential for an increased number of channels which can be assigned to DBS. This is a trade-off, however, since it reduces the permissible modulation level of the frequency modulated carrier and this offsets some of the advantages of the higher power.

Nearly all communications satellites achieve double usage of the spectrum by frequency reuse. This requires some form of polarization discrimination to separate the two signals. C-band and K-band satellites employ vertical and horizontal polarization. Some DBS applicants have specified circular polarization where discrimination is achieved by right and left handed rotation of the polarization vectors. This is one of the parameters of the system which requires standardization, and it now seems likely that circular polarization will become the standard.

DBS satellites are heavy, almost twice the weight of the lower C-band and K-band satellites in spite of the smaller number of transponders.

This in turn leads to a requirement for more fuel for station keeping and a shorter life.

The greater weight also necessitates the use of the space shuttle as the launch vehicle.

And, finally, DBS satellites are expensive. The cost of an in-orbit 6-channel satellite is estimated to be in the order of $125 million.

System Concept

We now turn to the DBS systems concept.

Four orbital locations or slots will be assigned, one for each time zone, and several satellites will share the same slot. This is important because the antenna on your roof will be directional and can only pick up the signals from a single slot. One applicant has made a strong plea to the commission to reduce the number of slots to 3 and to combine some of the time zones. It seems likely, however, that the 4-zone format will be finally approved.

Each slot will be about 350 miles in the east-west direction and 90 miles in the north-south. With careful coordination, it will be possible to operate 6 to 8 satellites clustered in each slot without bumping. With this arrangement, as many as 40 TV channels could be broadcast from the satellites in a single slot, thus utilizing the entire region of the spectrum assigned to DBS. All of these channels could be received by a single roof-top antenna since they would all be within its directional beam.

With the systems arrangement just described, it would be necessary for a programmer to lease a channel on each of 4 operating satellites to provide complete coverage of the continental United States. In addition, the satellite carrier should provide at least one in-orbit spare which could quickly replace any operating satellite which might fail. It may even be necessary to provide two in-orbit spares since it is not certain that a single satellite antenna can be sufficiently versatile to provide a satisfactory signal from all of the time zone slots.

This will be expensive. It is estimated that the lease cost for a single channel on a complete system will be upwards of $50 million per year. The total lease rate for 40 channels, then, would be over $2 billion per year. Without attempting to be very precise, it would seem that this is considering in excess of the revenue capacity of the system for many years to come. The conclusion, therefore, is that the number of DBS channels which will become available in the forseeable future will be determined by economics, not spectrum availability. There is plenty of room there for everybody!

Uses for DBS

We now come to the most important question of all: how will DBS be used? How will these satellites fit into the total pattern of television program distribution?

To answer this question we must look at the complete gamut of television distribution systems. For purposes of this discussion, these can be divided into broad categories: terrestrial broadcast systems and nonbroadcast services (Figure 3).

In the first category, standard broadcast stations continue to provide the backbone of television program distribution in spite of the competition which they are receiving from other distribution systems. Their main competitors, cable systems, rely on standard broadcast signals for their basic service. Standard broadcast television will continue to prosper in the future, although its share of the market will continue to erode. It is limited, however, by the number of channels available and its almost total reliance on advertising revenue. It is these limitations, plus the inability of broadcast stations to provide satisfactory reception in sparsely populated and congested city areas, which provide the opportunity for other forms of program distribution.

Three other terrestrial broadcast systems are also shown in Figure 3: subscription or over-the-air pay TV, multipoint distribution service - a microwave distribution system, and low power television. Each of these will find a place where it will provide a specialized service.

Figure 3

TELEVISION PROGRAM DISTRIBUTION SYSTEMS

- TERRESTRIAL BROADCAST SYSTEMS
  - STANDARD BROADCAST STATIONS
  - SUBSCRIPTION TELEVISION (STV)
  - MULTIPOINT DISTRIBUTION SERVICES (MDS)
  - LOW POWER TV (LPTV)
- NON-BROADCAST DISTRIBUTION SERVICES
  - CABLE TELEVISION
  - SATELLITE MASTER ANTENNA TELEVISION
  - DIRECT BROADCAST SATELLITES

But the real competition for DBS will not come from these broadcast services but rather from nonbroadcast services, cable TV and SMATV. We will now evaluate this competition.

First, we have the cable system. Television signals which are received off-air from broadcast stations or satellites are distributed to single family homes and to apartment buildings by coaxial cable.

Next, there is SMATV. For a variety of reasons, apartment owners may be unable to connect to a cable system. By combining off-the-air reception of broadcast stations and satellites and connecting these to a master antenna system for internal distribution, they can provide a mini-cable service for their tenants.

Finally, there is DBS. Its natural market is single family dwelling units.

In estimating the size of this market, three issues must be considered:

(1) DBS vs Cable
(2) SMATV and DBS
(3) K-band vs DBS for Single Family Dwellings.

We will now discuss these issues in turn.

Figure 4 compares cable TV and DBS.

Figure 4

CABLE TV vs DBS

- BOTH COMPETITIVE AND COMPLEMENTARY
- CATV IS BASIC NON-BROADCAST SYSTEM
  - OVER 54 MILLION HOMES HAVE CABLE AVAILABLE
- CATV USES C-BAND FOR PROGRAM DISTRIBUTION
- CATV/DBS COMPARISON

	CATV	DBS
- COST PER HOME	$500 - 1,000	$500 - 1,000
- NUMBER OF CHANNELS	12 - 100	3 - 18
- LOCAL PROGRAMMING	YES	NO
- BROADCAST PROGRAMMING	YES	NO
- SATELLITE LEASE COST (ANNUAL CONUS COVERAGE)	$1.5 - 3 Million	$50 Million

- CONCLUSIONS: DBS WILL HAVE DIFFICULTY COMPETING WITH WELL MANAGED CATV SYSTEM

We note first that they are both competitive and complimentary. Neither is optimum service for all situations.

Cable television has been building for many years, and it is the basic non-broadcast distribution system. Presently, more than 54 million homes have cable available.

C-band satellites are almost universally used for program distribution. With only a few thousand earth stations required to provide service to most cable systems, the lower priced C-band service is the most cost effective.

But the key factors in the competition between CATV and DBS are shown in Figure 4.

The figures show that costs for connecting a home to cable or for installing a DBS receiver are about the same. You may have seen lower estimates for the cost of DBS receivers. We believe they are over-optimistic. Often they omit or underestimate significant items such as installation costs or descramblers. In short, we believe that the local distribution costs for cable and DBS will be about a wash. The competition, then will be won by the medium which can provide the best service.

Let us look at the number of channels or - from the viewpoint of the subscriber - the number of programs which would be available. CATV systems have a minimum of 12 channels, and these are mainly older systems. Newer systems have 36 channels and up and in some cases as many as 100 channels. Furthermore, the older systems are being upgraded rapidly, and within a few years we can expect that most systems will have at least 36 channels. The number of DBS channels which can be *economically* supported is uncertain, but it might be as few as three or as many as eighteen. The high number would be an optimistic forecast.

Cable can not only provide a large number of channels but it offers a greater variety of programming. It can distribute not only satellite transmitted programs but also locally produced programming and off-the-air broadcast programming.

Finally, the cost of satellite distribution is much higher for DBS than for the C-band service which is now employed by the cable industry.

The conclusion which one must draw from this comparison is that DBS will have a very difficult time in competing with well-managed cable systems which provide a variety of services with good technical quality.

Let's now consider the relationship between SMATV and DBS, summarized in Figure 5.

Many apartments and condominiums or MFDU's will choose to use SMATV rather than cable. The issue is whether DBS or K-band will be used for satellite distribu-

Figure 5

SMATV and DBS

- MANY MULTIPLE FAMILY DWELLING UNIT (MFDU) RESIDENTS WILL USE SMATV
- DBS COMPETITION IN SMATV MARKET IS K-BAND SATELLITES
- K-BAND/DBS COMPARISON - MFDUs

	K-BAND	DBS
- EARTH STATION COST	$3,000 - 5,000	$500 - 1,000
- SATELLITE LEASE COST	$3.6-7.2 Million	$50 Million
- (ANNUAL CONUS COVERAGE)	1984-1985	1986
- AVAILABILITY		
- PROBABLE NUMBER OF PROGRAMS	12 - 24	3 - 12

- CONCLUSION: K-BAND WILL PREDOMINATE AS SATELLITE DISTRIBUTION MEDIUM FOR MDFUs

tion to SMATV systems. Figure 5 makes this comparison.

DBS has a clearer advantage in the earth station cost. This is a direct result of the higher power which permits smaller earth stations to be used.

The saving in earth station costs, however, is overwhelmed by the far higher cost of satellite distribution. If the number of earth stations were numbered in the millions, the added cost of the satellites might be cost effective; but with the tens of thousands of earth stations required for SMATV, the trade-off favors K-band.

K-band also will have the advantage of earlier availability - probably at least two years during which it can become firmly established.

Finally, the lower cost of K-band distribution will probably result in the availability of a larger number of programs on K-band satellites.

It appears, therefore, that K-band will predominate as the distribution medium for MFDU's.

There is one industry group which is taking the position that K-band is not only the preferred medium for multiple family dwellings but that it will predominate for single family dwellings as well (Figure 6). It argues that antennas with diameters of 1 to 2 meters are economic and practical for individual homes as well as for apartment and condominium complexes. If one accepts this premise, all of the factors favoring K-band for SMATV - a head start and

Figure 6

K-BAND FOR SINGLE FAMILY DWELLING UNITS (SFDUs)

- ONE INDUSTRY GROUP PLANNING K-BAND CHALLENGE TO DBS FOR SFDUs
- ARGUMENTS
  - 1 TO 2 METER ANTENNAS ARE ECONOMIC AND PRACTICAL FOR INDIVIDUAL HOMES
  - K-BAND WILL PROVIDE MUCH WIDER PROGRAM CHOICES BECAUSE OF LOWER SATELLITE COSTS
  - K-BAND WILL HAVE HEAD START
- MARKETPLACE WILL DECIDE!

wider program choices - would apply to single family units.

This is an issue that will be settled in the marketplace and probably during the next two or three years.

DBS Prospects

So far, we have discussed the segments of the market where DBS would have difficulty competing, and this may have given an overly pessimistic impression. There is in fact a prime potential market for DBS. It is single family dwelling units which are not receiving satisfactory cable service.

This is a substantial market. It includes areas which do not have cable or where cable availability will be long delayed. It includes areas where the number of channels on the local cable system is limited. It includes areas where the cost of cable service is inflated by unrealistic franchise fees. And it includes areas where the cable TV service is poor.

In total, it is estimated that the potential DBS market is 15 to 20 million homes. This is far from the 80 million homes in the country, but it is still very substantial. Our studies show that a DBS system could be profitable for a programmer if 5 million of these homes installed DBS receivers. By comparison with the penetration of CATV in its market, this would not appear to be an unreasonable prognosis.

In the end, however, the success of DBS will not be determined by technology or, within limits, by costs. It will, rather, be determined by the variety and quality of programming which becomes available. Given an attractive program schedule, which, in many locations, cannot be obtained from other distribution systems, it would seem that the market penetration could reach profitable levels.

Some Conclusions

I will conclude this presentation with a brief report on the current status of DBS in terms of regulatory, technical and commercial considerations.

The regulatory situation is summarized in Figure 7.

Figure 7

CURRENT STATUS - REGULATORY

- FCC HAS GRANTED PRELIMINARY AUTHORIZATIONS TO 8 COMPANIES
  - RCA
  - STC
  - CBS
  - VIDEO SATELLITE SYSTEMS
  - DBSC
  - WESTERN UNION
  - GRAPHIC SCANNING
  - USSB
- ALL AUTHORIZATION LIMITED TO ONE OPERATIONAL SATELLITE
- ALL AUTHORIZATIONS SUBJECT TO TERMS OF RARC AGREEMENT, SUMMER, 1983
- FCC HAS NOT ESTABLISHED TECHNICAL STANDARDS TO ASSURE COMPATABILITY

The FCC has granted preliminary authorizations to 8 companies to begin construction of DBS systems. The terms of the authorizations provide that initial commitment of funds must be made by December, 1983 and the system must be completed in five years.

These are initial authorizations, and they are limited to one operational satellite for each applicant.

There will be a convention of RARC, the Regional Administrative Radio Conference, in Geneva this summer. The establishment of policies and frequency allocations for DBS systems is an important agenda item. All of the FCC's authorizations are subject to the terms of this agreement.

The FCC authorizations include no technical standards, not even those which would assure compatibility. The ability of receivers to pick up signals from all of the satellites in an orbital slot is a requirement for the economic success of the system. If compatibility standards are not

set by the FCC or by the RARC agreement, it is likely that the de facto standards will be established by the first company which launches a satellite. For the most part, the standards proposed are sufficiently alike that no major problem of compatibility is foreseen.

One exception is the high definition television systems which is proposed by CBS. This would require non-standard television receivers of a new design. CBS asserts that technology has progressed to the point where high definition television is feasible and that DBS provides a unique opportunity to introduce it. A discussion of this issue is beyond the scope of this presentation.

The most difficult technical problems in DBS may be the mundane ones of receiver design.

The basic technology for DBS satellites is available. While major development work of a high level of sophistication will be required, there are no technical problems requiring dramatic breakthroughs. Further, recent successes would indicate that the space shuttle is a satisfactory launch vehicle.

The design of the receiver system will be a challenge. It must be extremely low priced, and it must perform well and reliably with very little maintenance. It must be capable of easy installation. And since many or most of the programs will be pay TV, it must have a system for addressable descrambling which is both secure and inexpensive. Manufacturers are working very hard on these problems today, and we can be reasonably certain that satisfactory answers will be found.

As to the current commercial status of DBS, to date, only one applicant, STC, has actually placed an order for a satellite. We were pleased, of course, that RCA Astro-Electronics was selected as the contractor.

The other applicants, including RCA Americom, are now in the planning phase. The planning efforts include serious dialogues with their potential customers, the program suppliers.

The program suppliers, too, are engaged in a major planning effort. This is a new industry, and no clear pattern has yet emerged. It is generally agreed, however, that a premium pay service will be required to make the business of supplying programs profitable. One proposal is that the programmer would offer a "package" which would include a pay TV service plus two advertiser-supported channels - perhaps sports and news.

Program suppliers are also giving attention to the massive task of sales and service. This is no small problem. Imagine for example, the magnitude of the system which would be required just to do the billing and collection for 2 million subscribers scattered over the entire 48 states.

To summarize - a very large amount of planning effort will be required before any of the participants in this business, the program suppliers, the satellite operators, receiver manufacturers, and service organizations will really be in business.

And so, what is the bottom line?

DBS is certainly exciting!

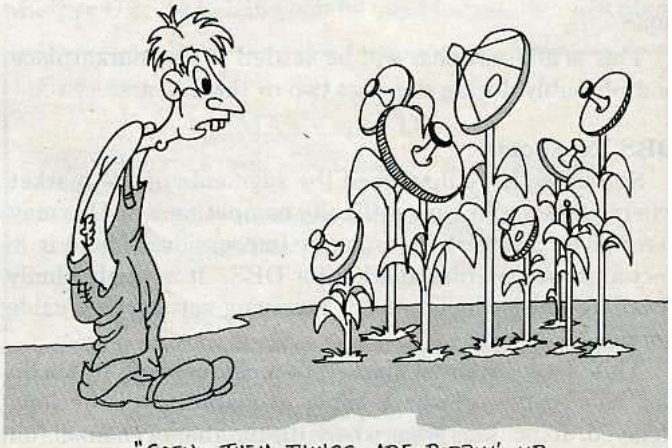
Any prudent assessment would have to conclude that it is a high risk business which will require large investments for physical plant and programming.

On the other hand, it offers the potential for very large profits if it is successful.

One can only say that there are some very interesting times ahead!

Mr. Inglis served as President of RCA Americom Communications, Inc. from January 1977 to February 1983 when he was elected Vice Chairman. He retired from RCA Americom on June 1, and presently serves as a consultant to the company.

The above article reprinted from the July 1983 edition of Satellite Circuit. Special thanks to RCA Americom, the American Institute of Astronautics and Aeronautics, John Williamson and Andrew F. Inglis.



Satcom I-R Joins Americom Fleet

Newest Spacecraft Now Operational

Satcom I-R, the newest and most versatile C-band domestic communications satellite ever to be orbited by a Delta launch vehicle, went operational in May following its on-schedule launch at 5:39 p.m. (ET) on April 11.

Positioned at 139 degrees West longitude, the spacecraft replaces Satcom I, RCA Americom's first satellite, which has been in service since 1976. Satcom I has been relocated from 135 degrees to 119 degrees, where it is co-located with Satcom II. Both spacecraft now serve as one. They are expected to remain on station for several months until their supply of station-keeping fuel is nearly exhausted, after which they will be retired and removed from geosynchronous orbit.

Multiple Missions

The versatility of Satcom I-R stems from its mission. It is designated as an in-orbit spare to protect not only the Alascom, Inc., satellite Aurora (Satcom V: see Satellite Circuit 1983 No 1.) but also RCA Americom's other operational spacecraft in the unlikely event of an in-orbit satellite failure. Should it be required for Alaskan service, the new spacecraft has the capability of switching its antenna pattern to put a high signal strength into that state; 39 dBw effective isotropic radiated power (EIRP) vs. a nominal 34 dB W for typical service.

Otherwise, Satcom I-R's mission is to carry RCA Americom's digital audio transmission service for radio networking, and its new television channel service.

Digital audio transmission service is being used by the major radio networks to distribute high-quality stereo or monaural programming to their affiliates on a regional or nationwide basis at one low cost. Television channel service is being used to assemble specialized or ad-hoc networks to cover special events; to distribute sports, cultural or entertainment programming on a syndicated basis, and to provide other services such as videoconferencing.

Second Advanced Satcom

Following Satcom V, Satcom I-R is the second domestic communications satellite to employ 8.5-watt solid-state power amplifiers, elliptic function filters and a shaped-beam antenna that together provide improved performance and reliability over earlier spacecraft. The third in the series will be Satcom II-R, which will replace Satcom II, launched in March 1976.

This article was reprinted from the July 1983 edition of Satellite Circuit. Special thanks to RCA Americom.

Liftoff for Satcom I-R, the newest spacecraft in the RCA Americom fleet, occurred at 5:39 p.m. (ET) April 11. The Advanced Satcom is being used to carry digital audio transmissions for radio networking, television channel service and voice/data/video traffic throughout the United States.

(NASA photo)

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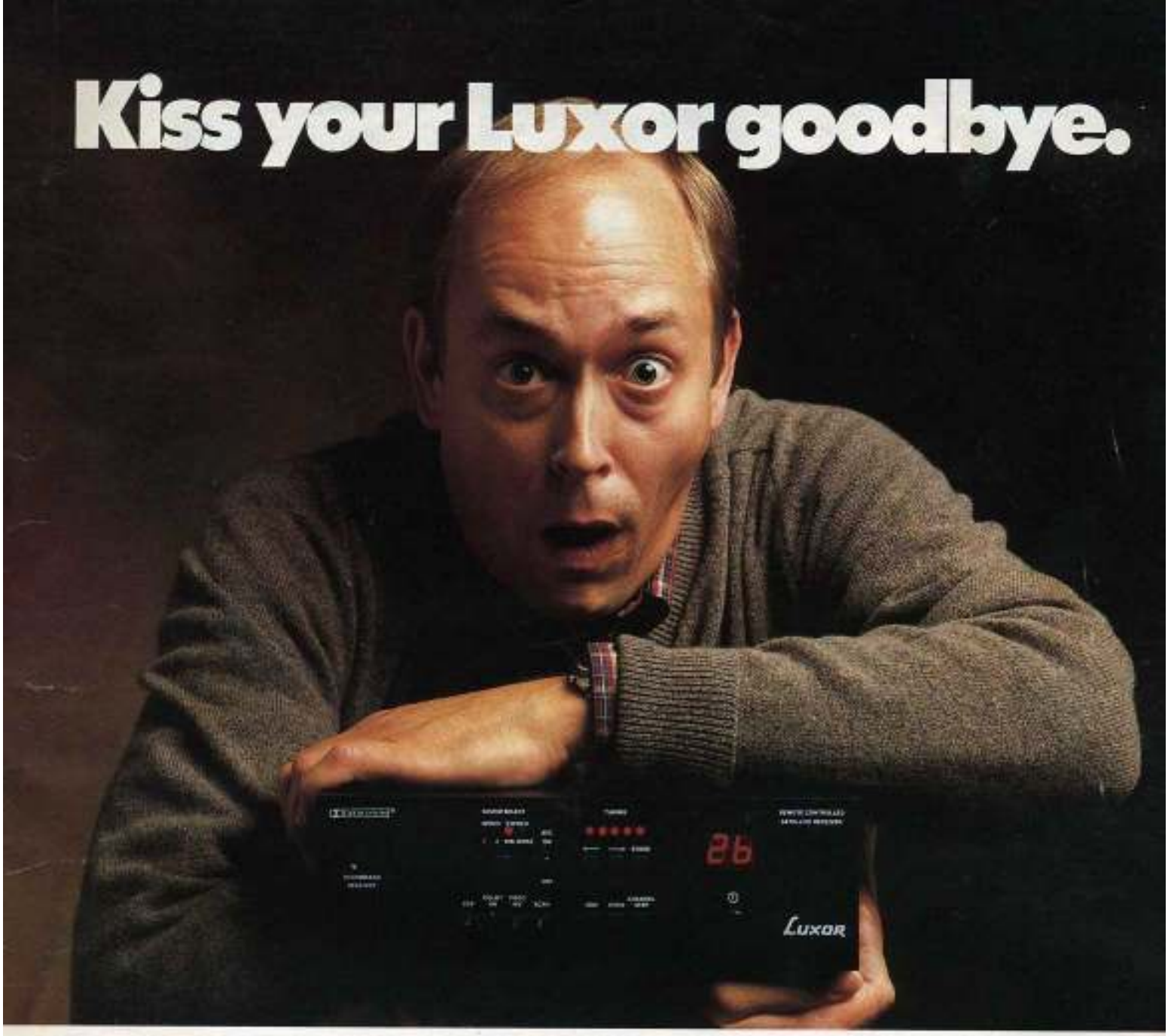

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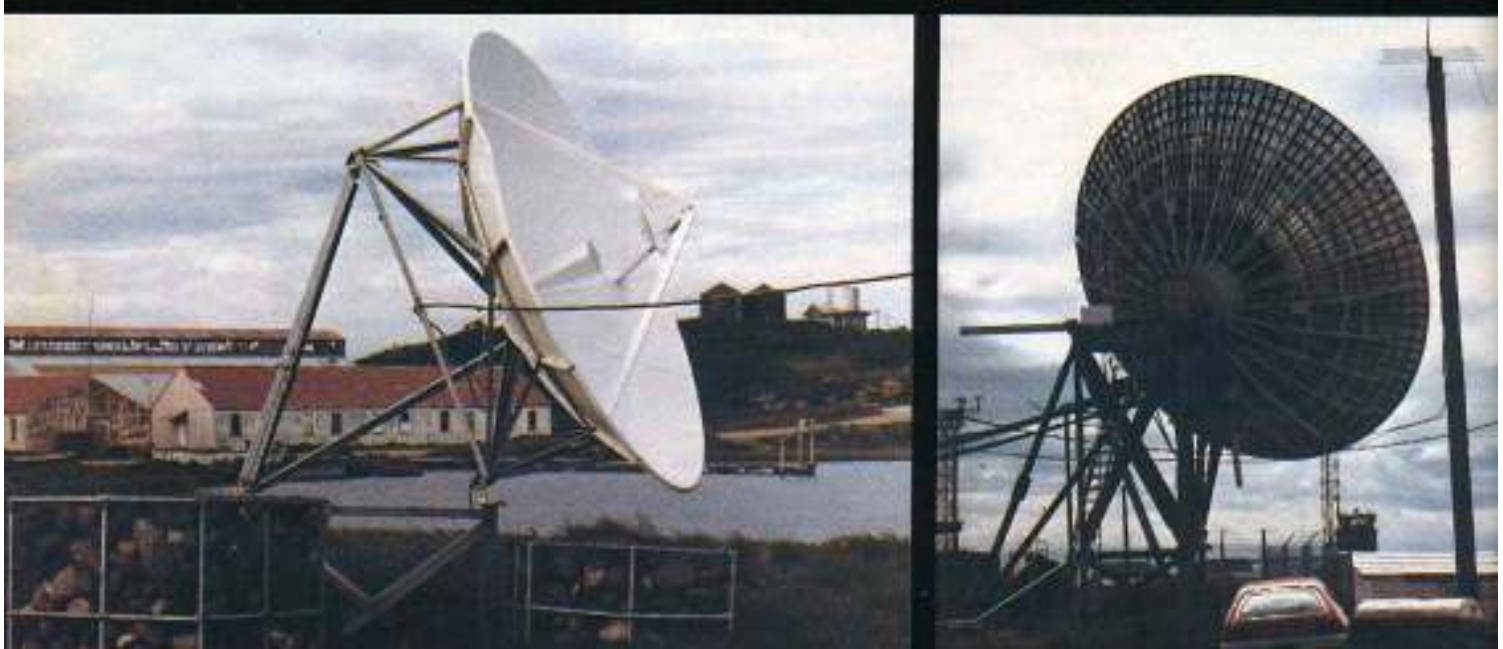
In Alaska, the satellite television and communication industry is essential for a state with a population of 475,000 and an area 1½ times the size of Texas.



Alaska

The Land of the Midnight Sun is Meeting the Dawn of New Technology

By Tim Olin

What a difference a day makes! Well, really what a difference a year makes. The advent of satellite TV has changed many concepts keeping isolated individuals and families updated on news and events in other parts of the U.S., Canada and (if you understand Spanish) Latin America. As we noted in the July issue of "Satellite TV Magazine", the state of Alaska has appropriated funds for the purchase of 100 - 4.5 meter earth stations to serve remote villages. I visited 4 of those remote villages while commercial fishing during June and July of '83. Prior to that I had been in those villages while fishing in the summers of '78 through '80. What follows are my first hand observations and impressions.

The year Seattle won the NBA championship was the big year for fishing in the Bristol Bay. As many fishermen and cannery workers are from Seattle, the event of the day was any early morning visit to Fisherman's Bar for the off-air live broadcast of the game. In '83 it was the 76ers live via satellite on a Sony big screen - in living color, 16 foot dish, KLM Sky Eye Receiver and actuator. Two of the bars in Naknek have them. Unfortunately one went down in a big wind, collapsing when the actuator broke down and they didn't get it in the stall position (pointed straight up). The antenna company is sending them another antenna at no cost but the bar must pay the freight. The last time the freight bill came to $800.00.

Eggegik is a small village near the mouth of the Eggegik River and two dishes were in use there. One was an Odom and the other an Anixter. Phone service and the Alaska Satellite TV Project were provided. One of the dishes was next to the village clinic and was anchored by three cement pads as well as three cages of large rocks. A fairly unique installation for sure, put probably necessary. One of the antennas seemed to be experiencing LNA problems as a ladder stood in front of it the entire two days we were there. If it was something major I'm sure the down time would be considerable as there are few TVRO stores in the bush.

I was in King Salmon one day and saw a couple of guys prying heat tiles off the back of Alascom's dish. The antenna was an Anixter with a specially built mount. I talked with them a while until it started raining too hard to stand looking up and continue the conversation without drowning. The dish was four years old and the heat tiles would not prevent ice build up. There is a small Air Force base at King Salmon and they said the commander didn't particularly care for the phone communication interruptions especially in the interest of national defense. I did visit with them long enough to find out that the two men were Alascom employees and they traveled around installing dishes and taking care of them. They went on to say that most of the dishes that they used were Anixters, S.A.'s and Harris.

There also was a TVRO installation at the Air Force Base that provided 4 channels of viewing. They had their dish for about a year and in that remote duty it was greatly appreciated. After talking to many of the people around the area the next best thing to the entertainment a dish brings is the fact that events were brought to them immediately. It seemed that although they were in very remote areas they still could observe what was going on in the "outside" world. (Outside being the lower 48 states.) In some ways they have the best of both worlds. They can stay in touch with the rest of the world, but when it gets to be more than they want they can simply turn it off and melt into one of the most remote and beautiful places in the world. Alaska, prime country not only for the use of satellite technology, but also for getting away from it when you choose to.

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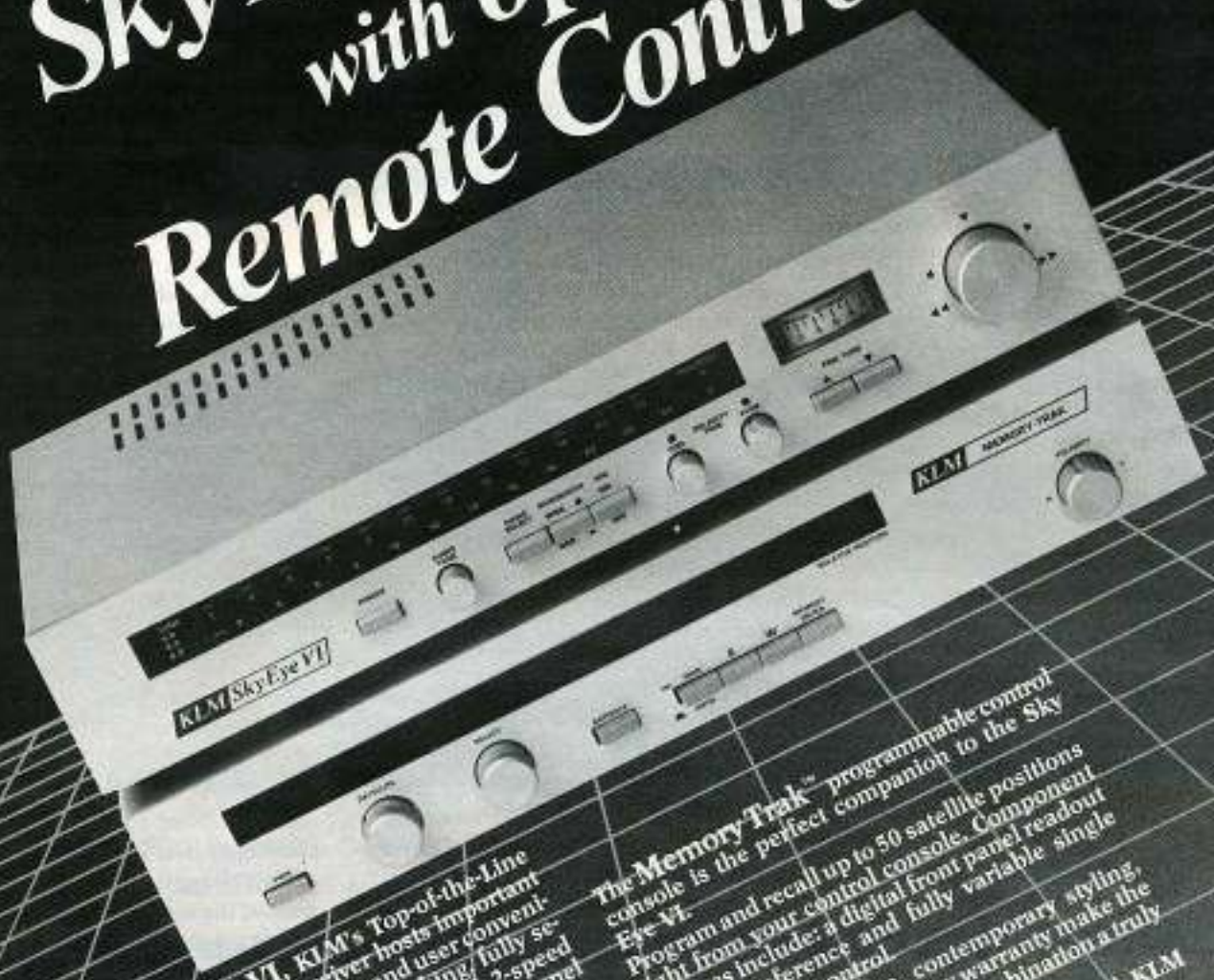

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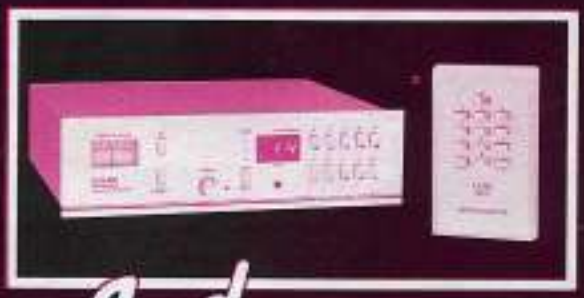

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Solar Sail Race to the Moon

By Jeffrey Manber

Imagine long sheets of aluminized plastic, just micrometers in thickness, unfurling like sails in the emptiness of space. Imagine not one but three of these spacecraft, slowly moving in a wide orbit above the earth, directed by radio signals from the ground.

It is sometime in 1986, at the start of the solar sail race to the moon. And not since the first airplanes raced across the Atlantic will a single race attract the attention of the entire world, and also introduce in dramatic fashion a new type of transportation.

Three years before the start of the race, French engineers organizing the event must still overcome some major hurdles. The solar sails must be built; corporate sponsors must be found and there must be other solar sails able to compete. Both the Japanese and Czechs are designing their own solar sails, but the leading organization, the World Space Foundation in California, has so far declined to participate in the event. They believe a race would serve no technological purpose and should be delayed until solar sails are more sophisticated.

Maybe it should be delayed. But what an idea! Had the early aeroplane races been postponed for the same reason, it might have taken a decade to advance beyond the Wright brother's machine and a generation before air travel was commonplace. Solar sails are also an idea which has been speculated on by both poets and engineers. The very simplicity of ships hurling

Pictured at left: WSF ½ size prototype sail fully deployed - full size prototype sail is nearing completion with an expected test deployment by the end of the year.
Credit: R. Dowling, Metavision/World Space Foundation.

Within a few years, geostationary satellites might all have small solar sails, to keep the satellites within their assigned location. Sails could be used instead of fuel to constantly nudge the satellite back to the proper location, as has already been done in the European communications satellite, OTS.

through space, powered only by light from the sun, able to roam virtually forever, is a powerful image.

Solar sails will rely on two ever-present forces; the pull of gravity and the push of photons, which are particles of light. Navigating like sailing ships on the ocean, these craft might one day become the preferred vehicles for carrying freight between space stations, on interplanetary missions or even for moving small asteroids to floating bases where the raw materials will be used for space industries.

Within a few years, geostationary satellites might all have small solar sails, to keep the satellites within their assigned location. Sails could be used instead of fuel to constantly nudge the satellite back to the proper location, as has already been done on the European communication satellite, OTS.

Solar sails might also be used to relieve the overcrowded geostationary belt. If commercial satellites were fitted with large sails, the geostationary orbit could be "lifted" by maintaining positions above the crowded equatorial plane. This is not done now because of the expense of holding the desired position with a fuel-consuming satellite. The number of slots would greatly increase, thereby solving the many political and technological problems caused by a bumper-to-bumper geostationary belt.

So why bother with a race? It appears likely that solar sails will be able to contribute to our exploration of space. But many of the engineers now working on developing this new form of space transportation fear that the government will continue to ignore solar sails, especially since there are no major aerospace corporations which stand to profit from their use. In 1973, NASA approved of a solar sail mission to Haley's Comet, but the program was cut five years later. Many believe a race would serve as an emotional catalyst, prompting support on both a private and public level.

There is another reason. That of too few people realizing the beauty and wonder of space. Not since Armstrong's walk on the moon has a space event captured the world's attention. Members of U3P, many of whom also work for the European Space Agency, believe the solar sail race would excite the public as now only science-fantasy movies or UFO's seem capable of doing.

The race itself is suprisingly simple to describe. The fragile solar sails must be first carried into orbit by a launch vehicle. The preferred rocket is the French Arianne, because it ejects payloads into a higher orbit than the shuttle. Once in orbit, those controlling ships from the earth will send a series of radio signals causing the crates to open, the sails to unfold and the race to begin.

The sails will be positioned for directing the craft into a high earth orbit. With little mass and constant force from the stream of photons, the solar sails will gradually increase in a speed until, almost a month later, they will be traveling faster than a typical rocket. To assure public interest during the long race, each craft will have a package of cameras, ensuring spectacular shots of the earth, moon, sun and the other two ships.

As the solar sails pick up speed, their orbits will be further and further from the earth, and closer to the moon. The race organizers believe it will take 100 orbits and almost a year to finally pass behind the plane of the moon. The winner will be the first solar sail to lose contact with the earth, meaning it is on the far side of the moon.

A solar sail race to the moon will have many practical benefits. When finally completed, an amateur network of space vehicles and equipment will be in operation, free to explore other parts of our solar system. Public interest in space will undoubtedly be at an all-time high, and corporate sponsorship might mean funds for additional research. Much will be learned from a year-long race, and a second generation of solar sails will already be in development.

Meanwhile, somewhere off in space, the first clipper ships of the future will be riding an ocean with a different sort of wind, mapping routes for other sails sure to follow.

★ ★ ★

WESPERCOM'S PORTLAND SHOW

By David Day

Remember the Frank Sinatra song lyric "'There was a girl in Portland before the Winter's chill - We used to go out walking on October Hill" ..... well the Portland Show was just such a nice compact, sweet, down home affair. It was number three and third time lucky.

The exhibitors' list read like our industry 'Who's Who' and a speakers' schedule that would have been the envy of much larger Shows.

The Portland Coliseum was a perfect setting and the staff were ultra polite and helpful. It was well promoted and despite it's extreme N.W. location was well attended. Tay Howard was delighted to find Southern California weather and said so, giving a fine Seminar lecture, in a style that we now have come to expect. If some of our industry leaders were as modest as this gentleman, it would make a refreshing change.

The outside antenna farm looked productive in the fertile Oregon landscape with more and more plastic 'Leggo' kits seen, in readiness for the forthcoming mass merchandising plan.

Show organizer, Evelyn Kessler, did a great job of organization. The day before the Show, she was functionally dressed and had her job well in hand. On opening day, she had changed and looked so attractive that even your old scribe began thinking of October Hill again!

All seats in the Seminar Room were completely filled, with more standing to hear twelve industry leaders speak on a variety of well chosen TVRO subjects. Ted Anderson, President of Automation Techniques, who manufactured that 'Great Little Receiver', gave an interesting address and slide presentation aided by his daughter. My pleasure to meet such a refined young lady.

Mary Olson of Conference Cassettes told me how well their Audio Recordings had been received. Leading companies like Amplica purchase their products so their progressive sales department can keep well informed. Optimum activity for their new Optimized Systems. They had outside displays, inside displays and Jerry Moore speaking. Burt Ashens, Sales Manager, leads his team well but I did miss Harvey Merade who sorted out our LNA problems in the past.

Wespercom's David Thomas introduced the speakers and managed just as well as seen in Washington, D.C. He is a good speaker with the proven ability to propose to his attractive honey blond wife, Jackie. My congratulations, David. You should run for President!

Some manufacturers did not seem so pleased with sales activities. But you cannot blame Wespercom's promotion and advertising that is known for a fact to have been extensive. Did the critics put in as much effort notifying their client lists or adding Portland Booth numbers to their advertising.

Evelyn Kessler told me that next year's Show may well move to Tahoe, which would be a better Western center in certain ways. Portland, Oregon takes some beating. "Oregon my Oregon". So the song goes. My middle name is John, so there is a little bias, with a town, river and dam of the same.

Just one very minor word of criticism - that "Just a Word or Two" in the Portland Program is very much the same as written by Rick Schnerringer in the STTI Trade Show Programs - almost identical. There were also a number of typographical errors in the program ... 'Jay' Howard is for the birds! He does prefer H. Taylor Howard. Despite that Evelyn, and you too Cliff, you ran a 'Great Little Show' with all the quality and longevity of that 'Great Little Receiver' - no prizes to readers who guess the manufacturer.

1983 Western Show Ratings:-

#1 STTI Las Vegas - size helps.
#2 Wespercom's Portland - a worthy runner up.
#3 Sat Expo Denver - no comment.

★ ★ ★

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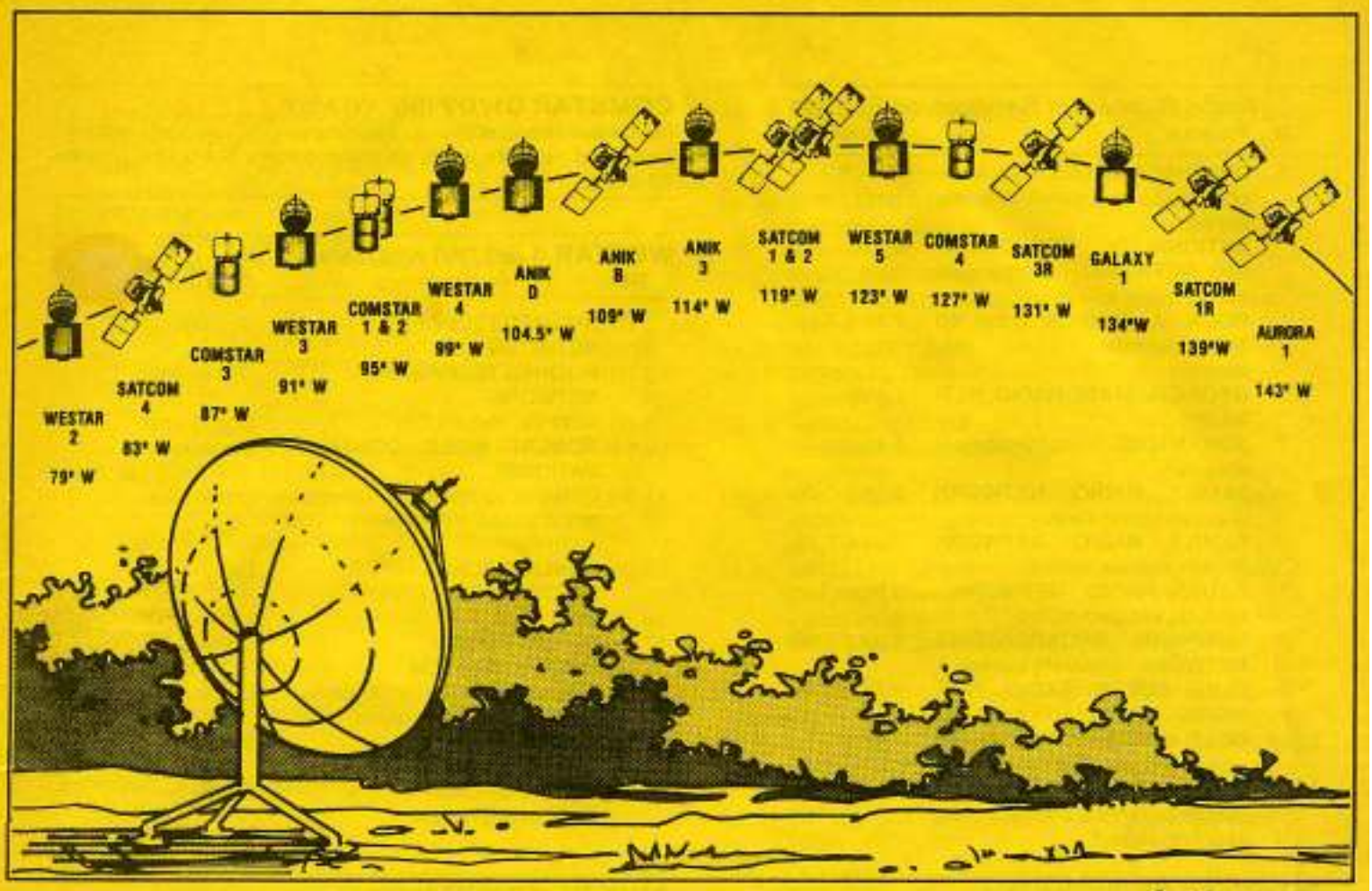
Existing & Future Satellites And Their Positions

Satellite	Position	Frequency (GHz)	Future Launch Date
SATCOM 2R	67°	6/4	1983
SPACENET II	69°	6/4 & 14/12	1984
SATCOM	72°	6/4	1984
GALAXY II	74°	6/4	1984
TELSTAR	76°	6/4	1984
RCA (Unnamed)	77°	14/12	1985
ADV. WESTAR	79°	6/4 & 14/12	1983
WESTAR 1/2	79°	6/4	
RSI	79°	14/12	1986
ASC	81°	6/4 & 14/12	1985
ABC I	83°	14/12	1986
SATCOM IV	83.5°	6/4	
USAT	85°	14/12	1984
WESTAR	86°	6/4	1984
COMSTAR D-3	87°	6/4	
TELSTAR 302	88.5°	6/4	To replace Comstar D-3
RCA	87°	14/12	1985
WESTAR 3	91°	6/4	
ADV. WESTAR	91°	6/4 & 14/12	?
SBS IV	89°	14/12	1984
SPACENET III	91°	6/4 & 14/12	1985
GALAXY III	93.5°	6/4	1984
SBS 3	95°	14/12	
COMSTAR D1/D2	95°	6/4	
TELSTAR 301	95°	6/4	To replace Comstar D1/D2
SBS II	97°	14/12	
WESTAR IV	98.5°	6/4	
SBS I	99°	14/12	
G-STAR 1	103°	14/12	1984
ANIK A-1	104.5°	6/4	
G-STAR 2	105°	14/12	1984
ANIK D-1	104.5°	6/4	
CANADA	107.5°	14/12	?
CANADA	108°	6/4	?
ANIK B	109°	6/4 & 14/12	
CANADA	110°	14/12	1985
CANADA	111.5°	6/4	?
CANADA	112.5°	14/12	?
ANIK A3/A2	114°	6/4	
ANIK D2	114°	6/4	
MEXICO	113.5°	6/4 & 14/12	?
MEXICO	116.5°	6/4 & 14/12	?
ANIK C3	117.5°	14/12	
SATCOM I	119°	6/4	
WESTAR IV	119.5°	6/4	1985
USAT	120°	14/12	1984
SPACENET III	122°	6/4 & 14/12	1985
WESTAR 5	123°	6/4	
SBS V	124°	14/12	1986
COMSTAR D-4	127.5°	6/4	
TELSTAR 303	125°	6/4	To replace Comstar D-4
RCA	126°	14/12	?
ASC	120°	6/4 & 14/12	1986
ABC I	130°	14/12	1987
SATCOM III R	131°	6/4	
RSI	132°	14/12	1986
GALAXY I	134°	6/4	
SATCOM IR	139°	6/4	
AURORA 1	143°	6/4	

Italicized satellites are future launches.
Bold face satellites are already in orbit.



Programming Guide

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Future Programming Services

Satellite (if known)	Service	Possible Date
Satcom 4	HBO	
Westar 5	Rock 24	
Spacenet	ACTS Satellite Network	84
	Midwest Radio & TV	84
	The Pop Network	84
	SPN Programs	84
Unknown	The Pleasure Channel	unknown
	Super Sports Network	Fall
	C.E.N.T.S.	Fall
	Kid Vid Network	84
	The Channel Black	84

WESTAR 2 (79°) W) WESTERN UNION

TR	Programming	Time (EST)
3 (H)	Sports, News and Network feeds	Occasional
11 (H)	Sports, News and Network feeds	Occasional
19 (H)	Sports, News and Network feeds	Occasional

SATCOM F4 (83° W) RCA

TR	Programming	Time (EST)
1 (V)	**SIN** (National Spanish Television Network) Ethnic	Daily, 24 Hours
2 (H)	**FNN** (Financial News Network) Business News	Mon-Fri, 7am-7pm
	BRAVO - cultural	8 pm - 6 am daily
3 (V)	**SPN** (Satellite Program Network) Variety Entertainment	Daily, 24 Hours
4 (H)	**HOME SPORTS ENTERTAINMENT** Sports	6:30 pm-1am daily
5 (V)	**ABC** West Coast Programming	Occasional
6 (H)	**ESPN** Sports Feed	Occasional
7 (V)	**NCN** (National Christian Network) Religious	Daily, 24 hours
11 (V)	**HOME SPORTS ENTERTAINMENT**	6:30pm-1am daily
12 (H)	**THE PLAYBOY CHANNEL** Adult Entertainment	8pm-6am daily
15 (V)	**BIZNET** (The American Business Network) Business News	Mon-Fri 8am-2pm
17 (V)	**TBN** (Trinity Broadcasting Network) - Religious	Daily, 24 Hours
19 (V)	**THE AMERICAN NETWORK** - Movies	5pm-5am daily
22 (H)	**ABC** West Coast Programming	Occasional
23 (V)	**GALAVISION** Ethnic Spanish Language Programming	Sat-Sun 24 Hours Mon-Fri 4pm-4am
24 (H)	**NBC** Network Feeds	Occasional

Audio Subcarrier Services on Satcom 4

TR	Program	Subcarrier
3	**RHYTHM & BLUES** - Contemporary jazz/soul music (discrete stereo)	5.4 & 6.3
	NATIONALITY BROADCASTING NETWORK - Multilingual music, news, sports	6.435
	ROCK -A- ROBICS - top 40 Rock (discrete stereo)	7.38 & 7.56
	GEORGIA STATE RADIO NETWORK	7.695
7	**JOY RADIO** - contemporary religious	5.4
	FAMILY RADIO NETWORK (East) (discrete stereo)	5.58 & 5.76
	FAMILY RADIO NETWORK (West) (discrete stereo)	5.94 & 6.12
	ASTRO RADIO NETWORK religous talk and music	6.3
	SHERIDAN BROADCASTING NETWORK - (discrete stereo)	7.38 & 7.56
	BLUE SUEDE RADIO NETWORK - 50's and 60's classics	7.74
	GOLD MINE RADIO NETWORK - country & western	7.92
17	**SATELLITE JAZZ NETWORK** - contemporary/traditional jazz (discrete stereo)	5.58 & 5.76

COMSTAR D3 (87° W) AT&T

TR	Programming	Time (EST)
1 (V)	**SATELLITE TELEVISION SERVICE** (NBC) - Network Feeds	Occasional
4 (H)	**TRANSGLOBAL GALACTICA** - Network feeds, news, sports	Occasional
8 (H)	**ABC TELEVISION NETWORK** - network feeds	Occasional
10 (H)	**CBS TELEVISION NETWORK** - network feeds	Occasional
13 (V)	**CBS TELEVISION NETWORK** network feeds	CST feeds
17 (V)	**CBS TELEVISION NETWORK** - network feeds	CST feeds

WESTAR 3 (91° W) WESTERN UNION

TR	Programming	Time (EST)
5 (H)	**CNN** (Cable News Network)	Occasional
19 (H)	**HUGHES TELEVISION NETWORK** - Sports	Occasional
21 (H)	Network Feeds, News, Sports	Occasional
	INDEPENDENT NETWORK NEWS	Occasional
23 (H)	Network feeds, News, Sports	Occasional
	HSC-TV/The Bame Hour	Occasional

COMSTAR D1/D2 (95° W) AT&T

(occasional transmissions - sporting events, teleconferencing, news and network feeds on transponders 1-4-9-11-12-14-20 22-24)

WESTAR 4 (99° W) WESTERN UNION

TR	Programming	Time (EST)
2 (V)	**HUGHES TELEVISION NETWORK**	Occasional
4 (V)	**HUGHES TELEVISION NETWORK**	Occasional
6 (V)	**XEW-TV**, Mexico City	Occasional
9 (H)	**ROBERT WOLD COMMUNICATIONS**	Occasional
11 (H)	**CTNA** (Catholic Telecommunications Network of America)	Occasional
15 (H)	**PUBLIC BROADCASTING SYSTEM**	Daily
16 (V)	**CNN**	Occasional
17 (H)	**PUBLIC BROADCASTING SYSTEM**	Daily
20 (V)	**ABC** Network Contract Channel - live/taped network feeds	Occasional
21 (H)	**PUBLIC BROADCASTING SYSTEM**	Daily
23 (H)	**PUBLIC BROADCASTING SYSTEM**	Daily

ANIK D1 (104° W) TELESAT

TR	Programming	Time (EST)
8 (V)	**CHCH-TV** variety programming from Ontario's leading independent station.	Daily (Scrambled)
14 (V)	**TCTV** (Telemedia Communications Network) Variety Programming	Daily (Scrambled)
16 (V)	**CBC PARLIAMENTARY NETWORK** (English) Live coverage of the House of Commons from Ottowa and variety programming	Daily
18 (V)	**CITV-TV** - Alberta's Leading Station - Variety Programming	Daily (Scrambled)
22 (V)	**BCTV** (British Columbia Television) Variety Programming from British Columbia	Daily (Scrambled)
24 (V)	**CBC PARLIAMENTARY NETWORK** (French) - variety programming	Daily

Audio Subcarrier Services on Anik D1

TR	Programming	Subcarrier
8	**CKO-FM** Torronto, Ontario - All news and information radio	6.17
14	**CKAC-AM**, Montreal, Quebec French language station	5.41
	CITE-FM, Montreal, Quebec French language station	6.17

18	**CKRW-AM**, Whitehorse Yukon "Voice of the North"	5.41
	CIRK-FM, Edmonton, Alberta progressive rock, (mpx stereo)	6.17
22	**CFMI-FM**, New Westminister B.C. - soft rock, (mono)	6.17
23	**CFQM-FM**, Moncton, New Brunswick - Uptown Country Music (mono)	5.41
23	**VOCM**, St. John's Newfoundland - adult contemporary music (mono)	6.17

ANIK B (109° W) TELESAT

TR	Programming	Time (EST)
7 (H)	Network feeds, Sports and News	Occasional
11 (H)	**CBC NORTH** Variety Programming (Pacific Time Zone)	daily
13 (H)	Network feeds, Sports and News	Occasional
15 (H)	**CBC** (French) - Variety Programming	daily
17 (H)	**CBC**	Occasional
19 (H)	**CBC NORTH** - Variety Programming (Atlantic Time Zone)	daily

SATCOM F1 (119°W) RCA

TR	Programming	Time (EST)
1 (V)	**ROBERT WOLD COMMUNICATIONS** - Sports, News, Network feeds	Occasiona
3 (V)	Network feeds, Sports & News	Occasional
12 (H)	**NBC** - network feeds	Occasional
24 (H)	Network feeds, Sports & News	Occasional

WESTAR 5 (123°W) WESTERN UNION

TR	Programming	Time (EST)
1 (H)	**THE BLUEMAX THEATER CHANNEL** - X Rated Adult Programming	Thurs-Sat Midnite-6am (Scrambled)
2 (V)	**CBS TELEVISION NETWORK**, network feeds	Occasional
3 (H)	**WOR-TV** (New York Channel 9) independent	daily, 24 Hours
5 (H)	**SELEC-TV** - Movies, Specials	daily, 24 Hours
7 (H)	**CBS TELEVISION NETWORK**, network feeds	Occasional
8 (V)	**SATELLITE NEWS CHANNEL** News, National, International	daily, 24 Hours
10 (V)	**THE DISNEY CHANNEL (WEST)** family entertainment	daily 7am-11pm
11 (H)	**SATELLITE NEWS CHANNEL** Same as transponder 8	daily, 24 Hours
12 (V)	**THE DISNEY CHANNEL (EAST)** Same as transponder 10	daily, 24 Hours
14 (V)	**SATELLITE NEWS CHANNEL** Same as transponder 8	daily, 24 Hours
16 (V)	**SATELLITE NEWS CHANNEL** Same as transponder 8	daily, 24 Hours
17 (H)	**THE NASHVILLE NETWORK** country orientated entertainment	daily 9am-3am
18 (V)	**SATELLITE NEWS CHANNEL** Same as transponder 8	daily, 24 Hours
21 (H)	**SPOTLIGHT** Movies only	daily 24 hours
23 (H)	**DAYTIME** Programming for women	daily 1pm-9pm
23 (H)	**HEARST/ABC ARTS** (Alpha Repertory Television Service)	daily 9pm-midnight
24 (V)	**BET** (Black Entertainment Television) - Ethnic	daily 8pm-2am

Audio Subcarrier Services on Westar 5

TR	Programming	Subcarrier
17	**THE NASHVILLE NETWORK** (Stereo)	5.58 & 5.76
23	**ARTS** (stereo)	5.58 & 5.78
24	**BET** (stereo)	5.58 & 5.78

COMSTAR D4 (127°W) AT&T

TR	Programming	Time (EST)
8 (H)	**ON-TV**- Scrambled (movies)	daily 24 hours
11 (V)	**ON-TV**- Scrambled (movies)	daily 24 hours
13 (V)	**ESPN** - sports	Occasional
16 (H)	Network feeds, sports and news	Occasional
18 (H)	**THE COUNTRY MUSIC SATELLITE NETWORK (CMTV)**	daily

Audio Subcarrier Services on Comstar D4

TR	Programming	Subcarrier
18	**COUNTRY MUSIC TELEVISION** (stereo)	5.58 & 5.78

SATCOM F3 (131°W) RCA

TR		Programming	Time (EST)
1	(V)	**NICKELODEON** - Children's Programming	Daily 8am-9pm
		ARTS -Cultural Programming	Daily 9pm-midnight
2	(H)	**PTL** - Religious Programming	Daily 24 Hours
3	(V)	**WGN** - Independent programming from WGN-TV Chicago	Daily 24 Hours
4	(H)	**SPOTLIGHT** - Movies	Daily 24 Hours
5	(V)	**THE MOVIE CHANNEL**	Daily 24 Hours
6	(H)	**WTBS** - Independent Sports, News Movies	Daily 24 Hours
7	(V)	**ESPN** - Sports	Daily 24 Hours
8	(H)	**CBN** - Family orientated Programming	Daily 24 Hours
9	(V)	**USA CABLE NETWORK** Varied Programming	Daily 24 Hours
10	(H)	**SHOWTIME (WEST)** Movies and Specials	Daily 24 Hours
11	(V)	**MTV** - Music Television (stereo)	Daily 24 Hours
12	(H)	**SHOWTIME (EAST)** Movies and Specials	Daily 24 Hours
13	(V)	**HBO (WEST)** - Movies and Specials	Daily 24 Hours
14	(H)	**CNN** (Cable News Network) - Round the Clock News	Daily 24 Hours
15	(V)	**CNN HEADLINE NEWS** Compact Headliners	Daily 24 Hours
16	(H)	**HTN PLUS** - family orientated movies and specials	Daily 4pm-4am
		ACSN- the learning channel - educational	Mon-Fri 6am-4pm Sat-Sun 6am-1pm
		NJT (National Jewish Television) - Religious	Sun 1pm-4pm
17	(V)	**CABLE HEALTH NETWORK** - Health and Science	Daily 24 Hours
18	(H)	**THE ALTERNATE VIEW NETWORK** - Religious	Sun 8am-1pm
		ETERNAL WORD TELEVISION NETWORK Religious	Daily 8pm-12pm
		REUTER NEWS SERVICE (Scrambled)	Mon-Fri 4am-8pm
19	(V)	**C-SPAN** - Public Affairs	Daily 24 Hours
20	(H)	**CINEMAX (EAST)** Movies	Daily 24 Hours
21	(V)	**THE WEATHER CHANNEL** Weather	Daily 24 Hours
22	(H)	**MSN** -the information channel - Consumer Information	Mon-Fri 10am-1pm
		USA BLACKOUT NETWORK occasional video after 5pm	
		DAYTIME - programming for women	Mon-Fri 1pm-5pm
23	(V)	**CINEMAX (WEST)** Movies only	Daily 24 Hours
24	(H)	**HBO (EAST)** - Movies	Daily 24 Hours

Audio Subcarrier Services on Satcom F3

TR	Programming	Subcarrier
2	**SATELLITE RADIO NETWORK** - contemporary/religious	6.2
3	**MOODY BROADCASTING NETWORK** - religious (discrete stereo)	5.4 & 7.92
	SATELLITE MUSIC NETWORK - adult contemporary (discrete stereo)	5.58 & 5.76
	SATELLITE MUSIC NETWORK - country coast-to-coast (discrete stereo)	5.94 & 6.12
	WFMT (FM) CHICAGO - arts/classical (discrete stereo)	6.3 & 6.48
	BONNEVILLE'S "BEAUTIFUL MUSIC" -(stereo)	7.38 & 7.56
6	**MUSIC IN THE AIR** - country/western (discrete stereo)	5.4 & 5.94
	broadway/hollywood (discrete stereo)	5.58 & 5.76
	50's & 60's (mono)	6.435
	comedy/specials (mono)	7.695
7	**ESPN** - program schedule information	6.2
8	**CABLE JAZZ NETWORK**, - jazz (discrete stereo)	5.94 & 6.12
14	**CNN RADIO NETWORK** - all news radio feed	6.3

GALAXY 1 (134° W) Hughes Communications, Inc.

TR		Programming	Time (EST)
1	(H)	**HBO**	(to be announced)
2	(V)	**Group W/Westinghouse Broadcasting**	
3	(H)	**HBO**	
4	(V)	Reserve	
5	(H)	**Times-Mirror**	
6	(V)	**SIN** (Spanish International Network)	
7	(H)	**Turner Broadcasting**	
8	(V)	**Group W/Westinghouse Broadcasting**	
9	(H)	Reserve	
10	(V)	**Times-Mirror**	
11	(H)	**Reserve**	
12	(V)	**Group W/Westinghouse Broadcasting**	
13	(H)	Reserve	
14	(V)	**Viacom International**	
15	(H)	**SIN** (Spanish International Network)	
16	(V)	**Viacom International**	
17	(H)	**HBO**	
18	(V)	**Turner Broadcasting**	
19	(H)	**HBO**	
20	(V)	**SIN** (Spanish International Network)	
21	(H)	**HBO**	
22	(V)	**Group W/ Westinghouse Broadcasting**	
23	(H)	**HBO**	
24	(V)	Reserve	

also C-SPAN (Cable Satellite Public Affairs) transponder to be announced.

SATCOM 1R (139° W) RCA

TR	Programming	Time (EST)
1 (V)	ROBERT WOLD COMMUNICATIONS	Occasional
3 (V)	Sports, News, & Network Feeds	Occasional
8 (H)	INTERNATIONAL TELEVISION Domsat/Intelsat link channel	Occasional
13 (V)	NASA CONTRACT CHANNEL - live NASA missions and mission-related event coverage	Operated only during ongoing missions
20 (H)	ARMED FORCES SATELLITE NETWORK & Independent programming	Occasional
22 (H)	HI-NET COMMUNICATIONS - Network videoconferencing	Occasional

Audio Subcarrier Services on Satcom 1R

TR	Programming	Subcarrier
12	NBC RADIO NETWORK (pacific)	4.2
	(central/mountain)	4.6
	(Eastern)	5.0
	"THE SOURCE"	5.8/5.4
	TALK-NET	5.8

AURORA (143° W) ALASCOM (SATCOM 5)

TR	Programming	Time (EST)
19 (V)	network feeds, news & sports	Occasional
20 (H)	LEARN/ALASKA TELEVISION NETWORK	Occasional
21 (V)	network feeds, news & sports	Occasional
24 (H)	ALASKA SATELLITE TELEVISION PROJECT - network & independent programming	Occasional

PROGRAMMING NEWS

Country Music Television. Warner Amex Satellite Entertainment Co. apparently felt the CMTV trademark was too close to their MTV trademark, so they filed suit against Country Music Television.

WASEC had asked the court to enjoin the CMTV - venture parties from using CMTV or MTV in "any manner or form." The suit has been settled out of court by Country Music Television, agreeing not to use the initials "CMTV" in advertising and promotional pieces, instead using the full name of the service "Country Music Television". Although the defendants felt the suit was without merit, a spokesman for CMTV stated they decided it wasn't worth the effort to pursue the case in the courts.

NICKELODEON. Nickelodeon, the first channel for kids has been awarded the Peabody Award for Excellence. The George Foster Peabody Award has been called the "Pulitzer Prize" of the electronic media, and has been awarded to such outstanding shows as "M.A.S.H.", "60 Minutes" and "Hill Street Blues". This award marks a change in tradition for the Peabody Board in that this is the first time it has been awarded to an entire television channel.

This award comes at a time in which children's television is generally seen to be in decline, so the Peabody Board's selection of a channel devoted to children is particularly noteworthy. Nickelodeon is on Satcom F3, transponder 1.

SPN Launches The MusicChannel. Satellite Program Network, Inc. (SPN) and MusicChannel, Inc. are combined in a joint venture to provide cable television systems and broadcast stations with a video music program service.

The MusicChannel features adult contemporary music videos, with styles ranging from light rock, soul, and country to urban contemporary music. In addition, the MusicChannel will include artist interviews, concert information, concert footage and entertainment news. Video disc jockeys will add continuity.

Artists such as Diana Ross, Kenny Rogers, Earth, Wind & Fire, Al Jarreau and Crystal Gayle appeal to many viewers who cannot see those artists on other services.

SPN Adds Children's Program. "The Country Kids Show". A "first" for Satellite Program Network, Inc. (SPN) will be the introduction of "The Country Kids Show" in September.

A lively group of talented kids ages five to teenage will sing and dance their way into your heart. "The Country Kids Show" showcases new talent, rising young singers and pint-sized comedians in a fast-moving format similar to the "Hee-Haw" country program.

Watch for five-year-old Miss "Polly Darton," singing sensation, and the back hills cloggers. "The Country Kids Show" will begin at 10 a.m. each Saturday morning in September.

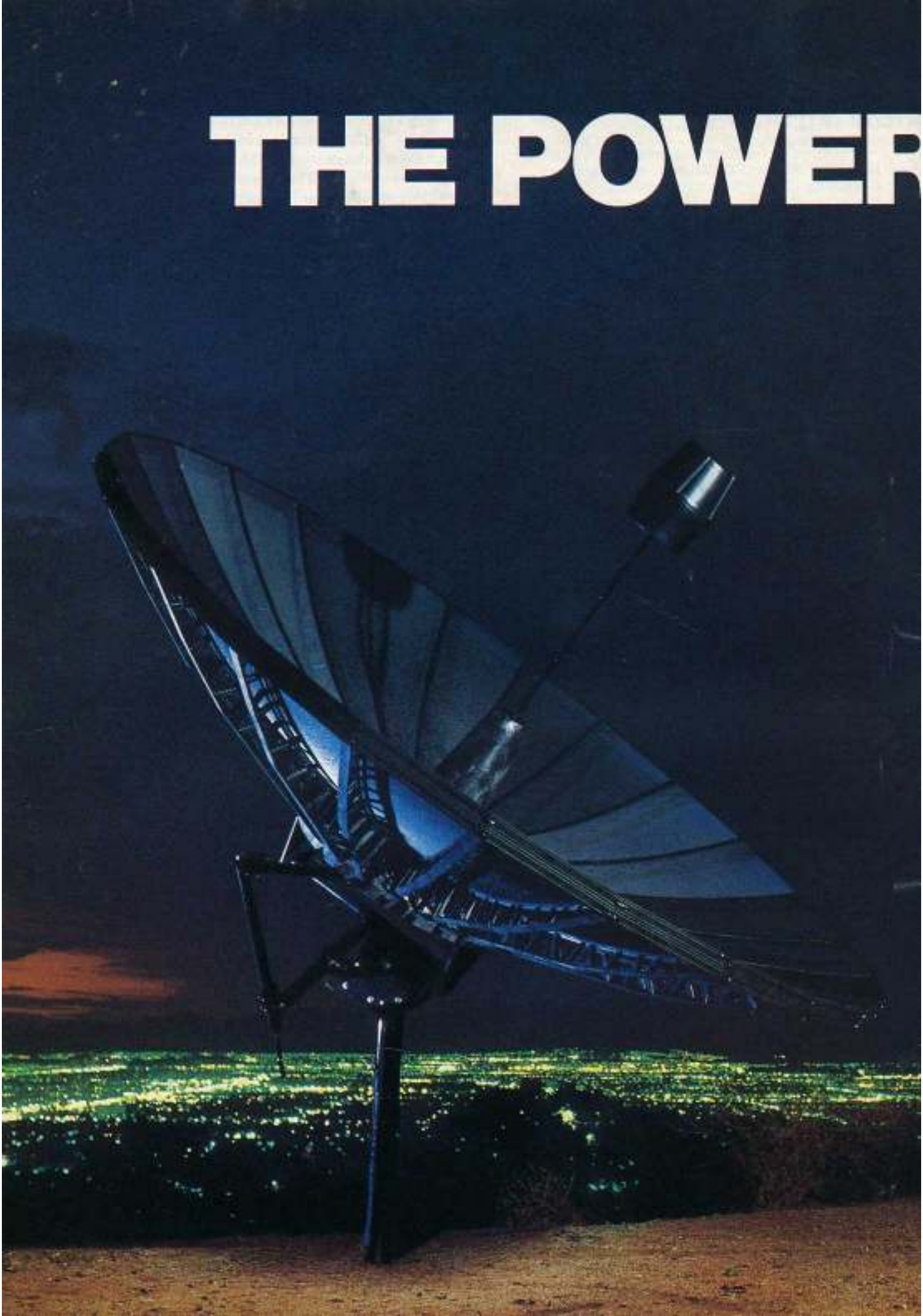
SPN is a 24-hour cable service located on Satcom IV, transponder 3. SPN provides international, financial and special programs, plus all-night films.

The Disney Channel Sets Fall Schedule. Burbank: The Disney Channel unveiled its fall and winter program schedule. James P. Jimirro, president of the family-oriented channel, revealed that four exclusive series, an afternoon cartoon show, docu-dramas and sports specials will, starting on September 1, be added to the outstanding line-up of feature films to be seen on the Disney Channel.

Jimirro said that several changes were made in the scheduling of certain programs in response to extensive subscriber research conducted among current subscribers to the Channel.

★ ★ ★

THE POWER



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*This accessory works only on a true parabolic dish with an f/d ratio of .32 or lower.

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Satellite Television Electronics

Precision Quality from Sweden.

The Whole Story:

It started in 1923, when Luxor began manufacturing radios in a small plant in Motala, Sweden. From our 3-tube, battery-operated radio through the development of our infrared remote control satellite receiver, we've learned a lot these past 60 years. And we've contributed significantly to the electronics revolution in a number of industries.

Aerospace. Personal computers. Automotive. Transportation. And more. With worldwide distribution and 20 acres of electronic laboratories and production facilities in Sweden, we're committed to being on the cutting edge of today's electronics revolution.

Technology Ahead of its Time.

For the exclusive high-performance Maserati, Luxor designed a high-powered controller that adjusts the engine for any grade fuel, any octane rating, automatically.

We've also designed shoplifting prevention systems that are virtually false-alarm proof. Totally distortion-free loudspeakers for Volvos. Even fuel efficiency systems for the Saab Turbo.

In the field of satellite electronics, we've developed a receiver regarded by experts as the standard of the industry since its 1982 introduction to the United States. With its advanced technology and precision-tuned reception, this receiver has already become the market leader. It's no wonder Luxor has become the first word in consumer electronics. For the very best of reasons. Quality.

The Luxor Receiver. Where Simplicity Functions Beauti

Now satellite technology comes ho with simplicity that's simply beautif That's because we engineered all receivers to give you the latest tech ogy with the least amount of trouti

You'll find controls right on the fron panel, so they're simple to read a to reach. Component and accesso hook-ups are simple to set up. In f only thing about the Luxor you wo simple may be deciding which mo you like best.

That's because our 9533 has all th features and proven performance looking for in a receiver, while our has all the same outstanding featu and then some. Including a host o cessory options to expand your vie pleasure even more.

LUXOR

The Standard Worldwide

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All You Need For The Finest Reception.

The 9533 is a total system that gives you everything you need to open your home to the world of satellite television. A built-in Chaparral Polarotor control and modulator, so there's no need for external rotor controls or modulator boxes. Smart styling, brushed aluminum housing, and signal strength LED display for the look of the future. Low threshold for excellent video performance. Stereo matrix and direct systems with narrow and wide band deviation are standard, as well as scan, video invert and defeatable AFC.

It all adds up to reliable, trouble-free, top-quality satellite reception. That's what the 9533 delivers hour after hour, day after day. And it does it all, at a surprisingly low cost. You simply can't find a better buy than the Luxor 9533.

Luxor 9533

Luxor 9550

The Ultimate in Satellite Reception.

For the most selective satellite television viewer, Luxor presents the 9550. High-performance video and stereo audio reception with precision dependability and the ultimate in features and accessories. Luxor has it all!

Built-in Chaparral Polarotor control and modulator for vertical and horizontal polarization, automatically. Signal strength LED display. Stereo matrix and direct systems with narrow and wide band deviation. Scan, video invert and defeatable AFC. Low threshold for video excellence. Plus Dolby dynamic noise reduction and a 2:1 audio expander.

Nothing else on the market comes close. Not in quality. Not in price.

60 Years of Uncompromising Quality.

After more than 60 years of quality control, research and development, only we at Luxor can make our kind of exceptional commitment to the reliability of our product.

That's why we offer a complete, full-year warranty on all parts and labor, guaranteed. And all Luxor distributors are factory-trained and fully stocked with authorized repair and replacement parts. That means you can get fast, 48-hour service from almost anywhere.

What's more, every Luxor satellite receiver is specially designed for years and years of picture-perfect performance, maintenance-free. We even put every unit of every model through 24 hour "burn-in" testing, ensuring the very highest in quality.

Whatever Luxor receiver you choose, be confident you're buying the best receiver you can find today. Most probably tomorrow.

Luxor has been around for 60 years, so you don't have to worry if we'll be here next week when you need us. That's important in an industry where new companies are here one day and gone the next. So when you buy a satellite receiver, think about the company behind it. Down the road, you'll be glad you did.

Luxor. 60 years of uncompromising quality. It will mean a lot to you.

Remote Possibilities Beyond Imagination.

Luxor accessories add even more to the 9550 to help you get the most out of satellite television.

Our actuator control lets you change positions on your satellite dish without leaving your house. And with our hand-held remote control unit you have instant access to any receiver or actuator function, plus all 24 transponder channels — right from your easy chair.

Even better, the 9536 sensor gives you direct access to all those same remote control functions from any room in your house. We call it remote remote control. You'll call it remarkable.

Luxor 9541 Remote Control controls virtually all functions with hand-held convenience. For the 9550.

Luxor 9534 Actuator interfaces with the 9550 for accurate and precision antenna location by remote control.

Luxor 9550

Luxor 9536 Sensor accesses 9550 receiver and 9534 actuator from any room in your home.

The Luxor 9533:

Input frequency: 70 MHz
Input level: −45 to −5 dBm
Input impedance: 75 ohm
Input connector: Type F
Tuning system: Digital voltage synthesizer with nonvolatile memory
Programmable channels: 24 + 8
Tuning voltage output: 1-30 V on RF input line
LNA power output: + 18 V
Scan: Included
IF bandwidth (3 dB): 26 MHz min.

Video deemphasis characteristic: CCIR Rec. 405-1, curve A
Video polarity: Positive or negative
Video output level (at 10.74 MHz peak dev.): 1 Vpp
Video output connector: Type F (75 ohm)
FM threshold (C/N 30 MHz): <8 dB
Video S/N at 14 dB C/N: 50 dB (weighted)
EDS rejection: 40 dB
Audio systems:
Mono 1 (6.8 MHz/tunable)
Mono 2 (6.2 MHz/tunable)
Stereo direct
Stereo matrix

Audio tuning: Preprogrammed or tunable
Audio tuning range: 5-8 MHz
Audio output level in "narrow" mode: (75 KHz dev.) 0 dBm (600 ohm)
Audio output level in "wide" mode: (75 kHz + 10 dB dev.) 0 dBm (600 ohm)
Audio output connectors:
Stereo phono plugs (left and right)
Mono F-connector
AC power input: 117 V, 60 Hz
Size (L × W × H): 280 × 270 × 100 mm (10" × 10-5/8" × 4")
Weight: Approx. 3.8 kg (8.4 pounds)

The Luxor 9550:

Input frequency: 70 MHz
Input level: −45 to −5 dBm
Input impedance: 75 ohm
Input connector: Type F
Tuning system: Digital voltage synthesizer with nonvolatile memory
Programmable channels: 24 + 8
Tuning voltage output: 1-30 V on RF input line
LNA power output: + 18 V
Scan: Included
IF bandwidth (3 dB): 26 MHz min.

Video deemphasis characteristic: CCIR Rec. 405-1, curve A
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The Luxor 9533 and 9550 are available exclusively at these United States distributors:

Allsat Inc.
Kansas City, Kansas
1-913-268-5151

Echosphere Corp.
Englewood, Colorado
1-800-521-9282

Echosphere West
Sacramento, California
1-800-338-5477 (out-of-state-western zone)
1-800-338-5478 (in-state)

High Frontier
Phoenix, Arizona
1-800-382-0395

High Frontier Northwest
Seattle, Washington
1-800-424-4011
1-206-575-0660

Hoosier Electronics
Terre Haute, Indiana
1-812-238-1456

Quarles Electronics
Greenwood, South Carolina
1-803-229-3638

Satcom USA
Palenville, New York
1-518-678-9322

Satellite Earth Stations
Mamou, Louisiana
1-800-762-2110 (out-of-state)
1-800-252-3307 (in-state)

Satellite Sales
Cleveland, Ohio
1-800-321-1188

Satellite TV Systems
Clemson, South Carolina
1-803-654-5569

Starcom
Big Springs, Texas
1-915-263-7512

TransVision Corporation
Greenbrae, California
1-415-924-6963

Warren Supply
Sioux Falls, South Dakota
1-605-336-1830

Southeast Satellite Distributors, Inc.
Saint Augustine, Florida
1-904-824-1915

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