

Introduction: *This huge area consists of more than 100 countries. Each of them has its own unique history and, together with their cultural pattern, economic opportunities and individual political situation, this has affected the development of the respective television broadcasting services. It would be virtually impossible to deal with each and every country in detail. Instead a general overview will be given and some important developments will be highlighted.*

Western Europe

Coverage and Color Standards

Television broadcasting in Western Europe is by now very well developed and the average coverage of population comes close to 100%. In 1978 the total number of television receivers in the West European countries has passed the 100 million mark (U.S., 135 million, Japan, 26 million). The number of sets per 1000 population amounts to 285 which is less than half of the figure for the U.S. (630), thus indicating that the market for television sets in Western Europe has not yet been saturated. Apart from Greece and Portugal, all West European countries have officially adopted a color standard; however in Greece some foreign programs are transmitted in color, either in SECAM or in PAL, depending on how the particular program originated.

Most countries use the PAL color standard, the only three SECAM countries being France, Luxembourg and Monaco. The amount of color versus monochrome

programs varies, of course, but in 50% of the countries all programs are in color.

Electronic Field Production (EFP)

In 1978 broadcasters continued to be very careful with decisions to make new investments. Reasons include an ongoing tight financial situation caused by inflation and by lagging of increases in viewers' fees behind increases of costs. Therefore cost effectiveness and efficiency have become more and more important decision criteria next to quality. It has become clear to many West European broadcasters that one possibility for saving money is to apply Electronic Field Production (EFP) techniques and many stations have started to produce some programs on this basis to gain experience. Apart from cost reduction, an essential requirement is that the quality of the final product matches that of the recordings made in the studios, so that viewers will not notice the difference when EFP and studio scenes are edited together in one program. The performance of cameras and VTRs specially designed for EFP applications will probably meet these quality requirements. However, the further development of EFP in Western Europe will probably be spread over a number of years because, in spite of the lower operating and investment costs in comparison with conventional techniques, considerable investments have still to be made. This situation not only affects equipment for the recording of the programs but also equipment needed for the post production, i.e., editing.

One-Inch Tape Formats

A significant event affecting the development of EFP was the adoption by the European Broadcasting Union (EBU) of the two 1-in tape formats B and C for the 625-line television standards, similar to the Type B and C formats for the 525-line television standards as defined by SMPTE. Type B is the format used by Bosch Fernseh in their line of video recorders and apart from the scanning of the videotracks it is practically identical for the 625- and 525-line standards. The situation is different for the Type C standard, although, basically, the SMPTE and the EBU formats are the same. Optional for the SMPTE format is the sync record between the control track and the audio 3 track, but no other information is allowed to be recorded in this area if the sync is not recorded. EBU felt that better use could be made of the available space on the tape and decided, after long discussions with the manufacturers (Fig. EA-1), that a second option would be possible in the form of another longitudinal track between the control track and the audio 3 track (Fig. EA-2). This track is called audio 4 and is identical in performance to the other audio tracks. Possible applications include an additional high quality audio track, to be used for commentary, multi-language applications, etc.; an editing track for dubbing to and from the audio 1 and/or 2 tracks (note that dubbing between the audio 1 and the audio 2 tracks is not possible as these tracks are too close to each other to allow use of one channel in record and the other in play



Fig. EA-1. The EBU Specialist Group on 1-in non-segmented helical-scan recording format with representatives of manufacturers during their third meeting on 23 January 1978. (Seated) the EBU specialist group — J. Heegard (DR), P. Zaccarian (RAI), P. Kelly (ITCA/LWT), C. Urban (BBC, Chairman), W. Nicholls (CBS), M. Farjaudon. (Standing) R. Crummeauer (Bosch), S. Sansom (Sony), P. Dare (RCA), K. Uchida (Sony), A. Heightman (Marconi), R. van der Leeden (Ampex), G. Woffindin (Ampex), D. Fibush (Ampex), D. Bowd (BBC, Secretary to the Specialist Group), L. Germany (PYE), J. Leeson (formerly Marconi, now Ampex), R. Sirinsky (Ampex).

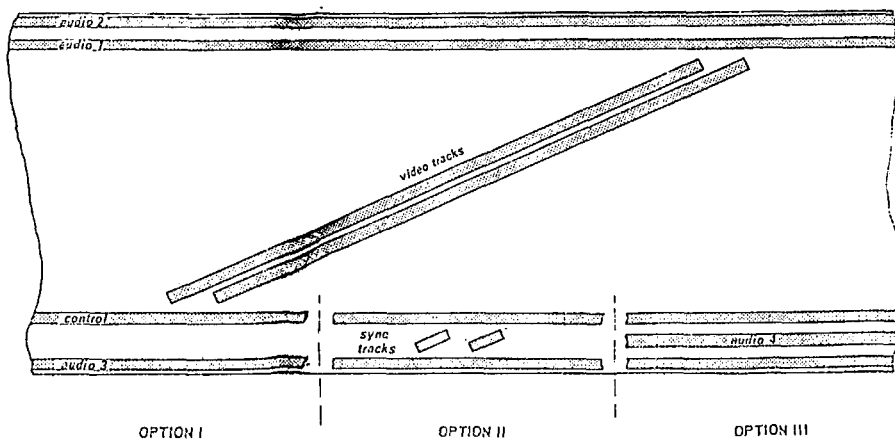


Fig. EA-2. The three options in the 1-in EBU format C. The space between the control track and the audio 3 track can be left blank (Option I), or can be used to record the sync tracks (Option II), or a fourth high quality audio track (Option III).

mode simultaneously); and an extra cue track.

If time and control code is to be used, it should be recorded on the audio 3 track. A consequence of the audio 4 track option was that measures had to be taken to avoid crosstalk from the adjacent control track. Therefore the original squarewave control track waveform was replaced by narrow pulses (with less low frequent energy than squarewaves) and the recording is made with ac bias. Consequently a control track erase head is needed for the EBU format machines, whereas the SMPTE control track is self-erasing.

The one-inch machines seem to fit the needs of the European broadcasters for their EFP applications. For both formats B and C compact portable machines capable of making high quality recordings are available. The studio recorders are still compact enough to be built into small mobile EFP units, so that productions can also be made in a more or less controlled operational environment.

Electronic Newsgathering (ENG)

The start of real ENG in Western Europe has been much slower than in the U.S. The major question is what quality level can be accepted.

Evaluation of both the U-matic format and the 1-in formats B and C has taken place in various countries. There is no doubt that the one-inch equipment is suitable for ENG as far as the performance is concerned. From a capital investment point of view the U-matic format machines are, of course, much more attractive, especially if one wants to compete with the cost of 16mm film news coverage. It should also be borne in mind that on single head helical video recorders, such as the U-matic types, much more is demanded from the machine in the 625-line standards than in the 525-line standards. First, the scanning speed is 17% lower due to the lower field rate (50 versus 60 Hz) in the 625-line standard, and second, the color subcarrier frequency in the 625 line standards is almost 24% higher than for

the NTSC standard. Thus, inherently, the performance level of any single-head helical video recorder is lower in the West European television standards, thus making it marginal for broadcasting use. On the other hand with the new "high band" U-matic format encouraging results have been obtained, especially if the number of generations in editing is kept low. If more generations than two or three are required it is much better to change to a different format.

Until the introduction of the "high band" U-matic video recorders, the overall picture quality of ENG material on the 625 lines/50 fields standards was mainly established by the recorder in case of the use of U-matic equipment. With the improved performance of the presently available U-matic recorders, the camera is starting to play an important role as well. After many experiments with the earlier Japanese cameras, it now seems that the trend will go in the direction of the compact 3/8-in 3-tube cameras such as the Ampex BCC-14, the Fernseh KCA 90, the Philips LDK 14 and the RCA TK 76.

The nature of ENG operations implies that realignment and other adjustments are carried out only after a number of consecutive assignments. Therefore it has become evident from the experiments and evaluations that reliability and stability are among the most important features that can guarantee a constant high quality performance.

Another reason for the slow acceptance of ENG type equipment is its more limited possibilities of application in comparison with the U.S. In Western Europe the majority of programming is done on a countrywide basis, this also involves news and commercials. News may be originated regionally, but is usually transmitted over the entire network. Where a form of local television exists, very little motion-picture material is used for the local news. Commercials are, in general, initiated by the manufacturer or importer of the product so the commercial spot for a new product is the same for the whole country, while in the U.S. it is quite normal practice that a new

type of car is presented by the local dealer as recorded on ENG type equipment.

Regional Television

The first signs of a change in the above mentioned situation are visible. There is an increasing demand from the public for a more regional or even local touch in the television programs. This led to an explosion of private television stations in Italy after a court decision ruled that the monopoly of RAI (the official State-owned broadcasting organization) was not applicable to cable TV or the UHF television bands. More than 250 such stations were operating in Italy in 1978 and in the areas with a high population density such as Rome and Milan, a frequency war has broken out between the numerous stations. They use all sorts of equipment from single-tube color cameras with VHS-format cassette recorders to three-tube color cameras with quadruplex videotape recorders. The Government has taken counteraction in setting up 21 regional RAI stations, which will all be on the air in the course of 1979. Each station consists of a studio with 3 or 4 Philips LDK 14 color cameras and 1-in format C video recorders with editing capabilities. For outside productions the high band U-matic format has been chosen; however editing of these programs will usually be done on 1-in tape to avoid more than one generation on the U-matic format. The target is for the regional stations to supply one-third of the total programs, the remainder being the RAI network feed from Rome.

Also in Sweden a basic decision has been taken to pay more attention to regional matters. Ten such regional stations exist already and in the next few years they will be further developed into equal size color studios with 1-in recording and editing facilities. Also for ENG-type of productions the trend is to use 1-in equipment for reasons of efficiency and uniformity. Unlike Italy, the regional stations in Sweden do not transmit their own programs, but merely supply their signals to Stockholm for insertion into the national network.

Similar ideas apply in Finland, however, only three of the seven existing small regional stations are included in the present 5-year-plan so it can be expected that the development will be at a slower rate than in Sweden.

Norway has five regional stations with limited monochrome studio facilities. Two of these have a color mobile, and colorizing of the remaining stations is planned for the next few years. Again there is only one network and the regional productions are being transmitted nationwide.

In Denmark there is one station in Aarhus, providing a regional color service apart from the network program.

The large Scandinavian countries (Sweden, Finland and Norway) have invested vast amounts of money in their transmitter network ever since television was introduced. The population density is very low

(e.g., 20 per square km in Sweden) so that the investment per head has been very high. In spite of the great distances (Sweden stretches nearly 1000 miles) the coverage figures are in the high nineties. For Norway (with 4 million inhabitants) 44 main transmitters and 2000 transponders were needed to achieve this result.

Of the remaining large West European countries, West Germany and the United Kingdom have the most mature regional television services. Both countries have three television networks. In *West Germany* the first and second networks (ARD and ZDF) are financed out of viewers fees and income from commercials. The third network mainly transmits cultural and educational programs. About 20% of the program time of the ARD network is transmitted locally by the nine regional stations. The two other networks transmit all their programs nationwide. The regional stations together supply the total of programs for the ARD network.

In the *United Kingdom* the BBC is responsible for two networks completely financed out of the viewers fees. Apart from a few hours daily in Wales and Scotland, very few BBC programs are transmitted on an exclusive regional basis. The third network consists of 15 Independent Television Companies (ITV), operating on a purely commercial basis. They share the production of all network programs and, in addition, various programs are transmitted locally.

In *France* the third program (FR3) is completely regional. There are 22 regional stations whose main contributions to the network are news items. They do not transmit local programs. Six of the 22 stations have facilities to produce studio programs. Format A 1-in video recorders have been used extensively for the news programs, and, presently, this equipment is being replaced with high band U-matic units. An evaluation program is underway to select the most appropriate tape format for other types of programs, such as documentaries. A choice will be made of either the high band U-matic format or one of the new one-in EBU tape formats.

In *Spain* a recently approved constitution guarantees freedom of expression and of the media, but no one has yet defined whether this includes the right to set up private radio and TV stations. A test case in Catalonia has been refused already, but not based on the Constitution. So there is still the possibility that in Spain a development will take place similar to what happened in Italy.

During the last few years *Austria* has been equipping nine regional radio stations (one for each province) with television equipment, especially for local news items. Until that time local news was produced on film and had to be developed in Vienna, thus losing much time. The selected videotape format is the one-inch format B. Each station will get two BCN 50 studio machines, one BCN 20 portable machine and four Ikegami HL 77 color cameras. Initially it

was the intention to split up the second network into a number of regions, who would transmit their own local programs. These plans have however been abandoned and the local contributions are inserted into the nationwide second network.

Switzerland and *Yugoslavia* have much in common in that they consist of a number of regions with different languages (respectively three and eight) and are therefore forced to have completely separate program coverage. There is, of course, much exchange of program material, especially news of common interest.

In *Switzerland* the law now also allows private local cable TV broadcasting. Whether this will take off to the same extent as in Italy is still unclear at this stage of development.

Digital Television

As elsewhere in the television world, digital television techniques have kept West European engineers' minds quite busy in 1978. Color television in Europe is now about 10 years old and decisions must be made for the replacement of the first generation color equipment. The question that was frequently heard in 1978 was how far away is the digital recorder? Interesting demonstrations by the IBA (UK) and numerous papers given at conventions have sometimes given the impression that the all-digital television studio is just around the corner; however, other papers and articles were more careful and realistic with their digital predictions. After the first excitement the future users have also taken a more practical approach, wondering what the real advantages will be and what kind of problems they may face with regard to the maintenance of this new type of equipment.

Certainly the all-digital studio seems to be far away. Viable digital cameras depend on the further development of charge coupled devices (CCDs) or other (not yet known) pickup elements. Furthermore, due to the larger bandwidth of a digital television signal (140 Mbits/s for the 625/50 television systems at $4 f_{sc}$ sampling rate) the present cabling for distribution purposes of the analog signals throughout the television station will not be suitable for digital signals. A solution could be the use of fiber optics, but again further development and experience in this field are necessary, in particular with respect to a reliable connector of reasonable cost.

Taking account of the above stated remarks, it could be concluded that the digital videotape recorder will be the first to become a realistic product. Certainly the pressure for a digital VTR is higher than for other digital television broadcasting equipment as the present analog VTR is still the weakest link in the chain between camera and transmitter. This especially applies where the post-production requirements ask for multiple generations.

On the other hand, there is great concern about standardization of tape recording for-

formats. The number of parameters to be selected is greater than for analog formats, and on top of that there are already different opinions in Western Europe on what the best sampling principle would be for PAL and SECAM signals. It is hoped that the users will soon take the initiative to start discussions with the manufacturers so that recommendations can be made before it is too late.

This concern applies not only to video signals but even more to the to be recorded audio signals. There is a consensus that the audio portion of the television program should be recorded digitally as well. VTR manufacturers would prefer to standardize on a format that can be used for the 24 frames/s film industry as well as for the 25 and 30 frames/s requirements of the 625/50 and 525/60 television standards for broadcasting. Only a limited number of sampling rates can satisfy these requirements and it is most unfortunate that 32 kHz, which is chosen by the EBU for the transport of digital audio signals, is not among these sampling rates. Conversion between the two different systems can theoretically be done (it will however cost money) but the probability is high that there will be at least two different audio recording formats in the future.

In general it is expected that the introduction of digital techniques in the broadcasting studios will be gradual. The number of "digital islands" in the ocean of technical units in a television studio will steadily increase. We see already the digital time base correctors, standards converters, frame stores, special effects equipment, character generators and teletext units. What will the next digital products be? Probably not a VTR, because that will still take a number of years. We would not be surprised, however if a digital telecine would be introduced in 1979.

Eastern Europe

Color Television and Coverage

The East European Socialist Countries (Bulgaria, Czechoslovakia, German Democratic Republic [GDR], Hungary, Poland, Romania and the USSR) all have television service. *Romania* is the only country which is still transmitting only in monochrome; however, plans for the introduction of color are well developed and it is expected that the first color transmissions will take place either in late 1979 or early 1980. All other countries have adopted the SECAM color standard and transmit color programs on a more or less regular basis. Apart from Czechoslovakia, PAL equipment is used throughout the studios and in the mobiles and the PAL signals are transcoded into SECAM at the transmitters.

No reliable figures are available on the television coverage in these countries but it can be assumed that for a country as large as the *USSR* it would mean a tremendous investment to reach a coverage figure of higher than 90%. Of the total estimated

number of receivers, amounting to 85 million, about 75% (64 million) are in the USSR. There is some variation per country in the number of television sets per 1000 population. The average for all countries is about 240 with Romania as lowest (120), the GDR as highest (300) and the USSR (with 250) close to the average.

Color television sets are very expensive. In 1977, 1.1 million color television sets were manufactured in Russia, part of them being exported to other East bloc countries. In Russia the price of every radio and television set is increased by a percentage which is used to cover the program costs. This, of course, makes the prices of equipment very high, but on the other hand the advantage is that no registration administration is needed. The total number of color television sets in use in the USSR in 1977 was estimated to be about one million.

Different Programs

All countries have at least two networks. In some cases the coverage of the second network is not yet as high as for the first network but expansion work continues, including the use of UHF frequencies.

In Moscow four different television programs can be received, with a total of 142 hours per week. One of these programs is exclusively for schools (6 hours per week) and another one is a local Moscow program (39 hours). The main network transmits 80 hours per week over the whole of Russia.

Many of the programs are broadcast in color but again no reliable figures of percentages are available for most of these countries. In the GDR 65% of the approximately 145 hours per week on two networks were in color in 1978, whereas for instance in Bulgaria 10 of the total 42½ hours were color programs.

Equipment

As a general rule the socialist countries try to buy as much as possible from their neighbor socialist countries rather than from the capitalist markets, the reason being that the availability of hard currency for imports is limited. This has stimulated the local industry to develop and manufacture their own products. Cameras as well as quadruplex VTRs have been built successfully and there is already great interest in the 1-in tape formats. The required quantities of equipment are, however, so large that a substantial percentage must be imported from Western Europe and the U.S. This, to a great extent, also applies to the coming Olympics of 1980 in Moscow for which contracts have been awarded to Ampex for videotape recorders, slow motion disk recorders and tape and to Thomson-CSF (France) for cameras, microwave links and the largest routing system in the world with a 200 × 200 matrix. Audio equipment will be supplied by the Hungarian company BEAG.

ENG and EFP techniques are of great interest for the socialist countries. Capital in-

vestments for this kind of equipment will be lower than for conventional installations thus allowing conservation of hard currency. In some countries evaluations are being carried out to compare the U-matic and 1-in tape formats; however, it seems that the U-matic techniques will not be considered as seriously as in Western Europe.

An interesting development was the introduction of advanced sound dubbing systems in *Czechoslovakia* (Prague and Bratislava). Sound dubbing for television programs from the foreign language into the local language is being done with the use of videotape rather than in the conventional way with the aid of film loops. Not only is the spoken word replaced but also the rest of the soundtrack that is finally put together with the aid of multitrack sound recorders and a computer controlled audio mixing desk. The output of one such system has been one finished program hour per week plus about 45 minutes of original material with commentary and/or synchronous sound. Another significant development was the installation of Ampex computer controlled editing installations in Moscow and in Prague. They work with quadruplex as well as with 1-in helical videotape recorders. The units in Russia have been equipped with a specially adapted Michael Cox SECAM vision mixer.

The Middle East

Introduction

Television in the Middle East countries is relatively young. Not until the oil exploitation was well underway and the money started to pour in, were decisions taken to start television services. Most countries took off in monochrome but once color television was introduced in the U.S. and Europe, the Arab countries decided that they, too, wanted to have color. Within less than a decade they went from nothing through a simple black-and-white system up to a complete color service. Sophisticated equipment was introduced and local engineers followed crash courses for maintenance. The major problem however was that these engineers did not have the opportunity to grow into television as in the TV stations in the Western World; in many cases this has resulted in severe growing pains.

These were definitely symptoms of a too fast growth and presently a period of consolidation seems to have started. The Arab nations are becoming more and more quality conscious and sophisticated as they increasingly travel around the world and attend the NAB show, the IBC in the UK, the Montreux Symposium in Switzerland and other exhibitions. Also the choice of equipment is now made more carefully than it was five years ago.

Present Situation

All of the approximately 15 countries have a television broadcasting service and most of them transmit color programs. PAL and SECAM have been adopted on an al-

most 50-50 basis, mainly due to political influences.

The total number of television sets just exceeds 3.5 million and the number of sets per 1000 population amounts to 35, which is very low in comparison with Europe (285) and the U.S. (630).

Due to limited production facilities and a shortage of experienced production staff many programs are originated by production houses in Greece and the UK. In 1978 about half of the Arab language programs were produced in Greece. The finished tapes are duplicated and shipped simultaneously to the 18 Arab countries that have joined in a program pool. The type of production is fairly straightforward with a minimum of editing. One of the studios has an output of one program hour per 8-hour shift and productions are going on 24 hours per day.

In many areas of the industry in the Middle East experts from abroad are offered attractive contracts for one or more years. To make life a little more pleasant for these expatriates, television services in foreign languages are being planned by various countries. In most cases these programs will be transmitted on a new second network.

Planning can, however, be difficult in the Middle East because of political instability; *Lebanon* and, lately, *Iran* are two examples of such influences. Up to the second half of 1978 when the political unrest started, Iran was gradually building up its broadcasting system in all respects, such as studios, mobiles, transmitter network, foreign language service, educational service, regional TV and training of production and technical staff. At the time of writing (January 1979) it is not clear how the political unrest and changes will affect this expansion program, but certainly it will, at least, be delayed.

Equipment

The color equipment in the studios in the Middle East is still relatively young so that there is not an immediate urge to change to "next generation" equipment. New equipment would also mean new techniques and therefore additional training would be required just when the engineers are starting to become familiar with the equipment they have been using for some time. Exchange of tapes is very important (see above) and is being done on the 2-in quadruplex tape format, so the expansion is also generally done with quad equipment. Obviously great interest is shown in new developments and the larger stations will certainly consider further expansion with 1-in VTRs. This will however occur at a much slower rate than, for instance, in Europe.

Africa

General Overview

Television in Africa shows many similarities with the situation in the Middle East. In general, television is fairly young and all stages of development can be seen,

starting with a very basic monochrome 3-hour per day, 1-transmitter service and reaching up to the sophisticated South African broadcasting system. The great differences in natural wealth, economics, home affairs and foreign politics are reflected in the size and organization of broadcasting in each country. Thirty of the 54 countries have some form of television service; however, the coverage in these countries is generally very basic. In only 15 countries are more than 10,000 television sets in use. The total number of sets in Africa amounts to 2.8 million, and the number of sets per 1000 population in the 30 television countries is as low as 8.6. Ten African countries radiate color programs to a certain extent. Both PAL and SECAM color television standards are being used, mostly based on historical ties with the European countries.

Large Television Stations

One of the first countries with television was *Nigeria*. First transmissions started in 1960 and the first color program went on the air on 1 October 1975 — the first official color transmission in Africa. Apart from the network programs, it is planned that each of the 19 provinces will have their own regional station from which they can feed the network as well as do their own local transmissions. Due to the size of Nigeria, 12 of the regional stations will have to make use of a satellite and already existing terrestrial stations for this program exchange. All 19 stations are on the air already, however most of them use an outside broadcast mobile as control room. It is typical for Africa that Nigerian Television is intending to set

up the new stations as turnkey projects so that no local coordination between various contractors on each project is required. This may seem a matter of minor importance but with the sort of difficulties that are experienced in Africa with logistics and administrative procedures, the measure certainly does make sense.

South Africa has a highly sophisticated television service which had been built up from nothing in a few years time. Long investigations and studies were carried out by a team of experts before any contract was granted. A large scale training program was carried out and when transmissions started on 1 January 1976, there was a full staff available with only little help from outside. Originally there were three phases of planned development, but economic considerations have forced the combination of phases 1 and 2 and the delay of phase 3. As a consequence the single national channel is shared equally between English and Afrikaans rather than each having separate networks. Phase 3, which is now being planned involves the establishment of a second network using the native languages and covering a large geographical area.

Other Countries

Nigeria and South Africa are two examples of African countries that are carrying out the build-up of their television service according to a structured plan, but this does not mean that they are the only countries with an extensive television service. Others are Algeria, Egypt, Ivory Coast, Mauritius, Morocco and Tunisia, all with a color serv-

ice and more than 20 television sets per 1000 population.

Almost all countries have plans either to start with television broadcasting or to extend the present service. Progress is usually slow due to limited budgets or to political complications (e.g., Ethiopia, Somalia, Uganda, Angola and Zimbabwe Rhodesia).

Equipment

A great variety of equipment can be found in the African broadcasting stations. Reliability is the most important feature they require. As in the Middle East countries there is a general shortage of well trained and experienced maintenance engineers. There is also a similarity with the type of programs. Little post production is being done; therefore, no sophisticated editing units are needed. The AVR-2 quadruplex video recorder is a very popular workhorse piece of equipment in many countries. There are already signs that the viewers are becoming more critical so that eventually more sophisticated equipment will be needed; however, this will still take some years and those needs can probably be fulfilled with the new one-inch video recorders. — *Robert van der Leeden*

Note: The following publications were consulted in the preparation of this report: *Internationales Handbuch für Rundfunk und Fernsehen 1978/79*, published by Hans Bredow-Institut, Hamburg; and *Conference Publication Number 166*, published by the Institution of Electrical Engineers for the International Broadcasting Convention, 25–29 September 1978, Wembley, London.

People's Republic of China

The Progress Report from the People's Republic of China did not arrive at SMPTE Headquarters in time to be included in this issue of the *Journal*. It will be published as an Addendum in the June issue.