CHAPTER

5.17

ENG, SNG, and Remote Video Production

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INTRODUCTION

[illegible] 1939, David Sarnoff of RCA introduced [illegible] the field to the few viewers of an [illegible] television broadcast system. He took a [illegible] World's Fair in Flushing Meadows, NY, [illegible] the signal to a New York City transmitter [illegible] of the broadcast by television sets in [illegible] store windows. From this humble begin- [illegible] production originating outside the [illegible] remote as it is known, has become a staple [illegible] produced by broadcast and cable net- [illegible] vision stations throughout the world.

[illegible] nology has made the delineation [illegible] end personal camcorders and suitable [illegible] use equipment a matter of just a few [illegible] dollars. The World's Fair remote in 1939 [illegible] entire truck to carry the gear for a single [illegible] with several engineers to make the [illegible] function. Current high definition (HD) [illegible] production equipment can fit in a [illegible] requires a crew of just one. Remote tele- [illegible] gained utility because of advances in [illegible] as well as the demand for programming. [illegible] part of the industry has reached a [illegible] significant amount of new technology is [illegible] and marketed specifically to meet the [illegible] type of television programming pro- [illegible], from news, sports, awards shows, [illegible] nature programs, documentaries, and [illegible].

[illegible] segment or program generated on [illegible] produced by a single person with a [illegible] recorder and perhaps a microwave link or Internet connection to send the content to the station. Or, it may be a sophisticated multi-camera production costing tens of millions of dollars in equipment and involving hundreds of people. This chapter introduces the various types of television remote operations and the equipment and facilities that are used. It provides guidance on planning a remote event and discusses some of the issues to be considered in procuring or building a truck for ENG, SNG, or remote video production.

FIELD PRODUCTION

Video production work performed beyond the confines of the studio is considered *remote* or *field production*. Television remotes can be grouped into a number of subsets with categories that often overlap: *electronic news gathering* (ENG), *satellite news gathering* (SNG), *electronic field production* (EFP), and the specific term *remote*. The Europeans often use the term *outside broadcast* (OB) for a remote.

Electronic News Gathering

Historically, prior to electronic cameras, images captured inside and outside the studio were shot on film. There were studio productions and shoots on location. Film productions shot on location tended to be of three categories: news, documentaries, or movies. In the early days of television news, the station sent out a photographer with a 16 mm film camera to shoot a story. The film was brought back to the station, developed, mechanically edited, and converted into a television

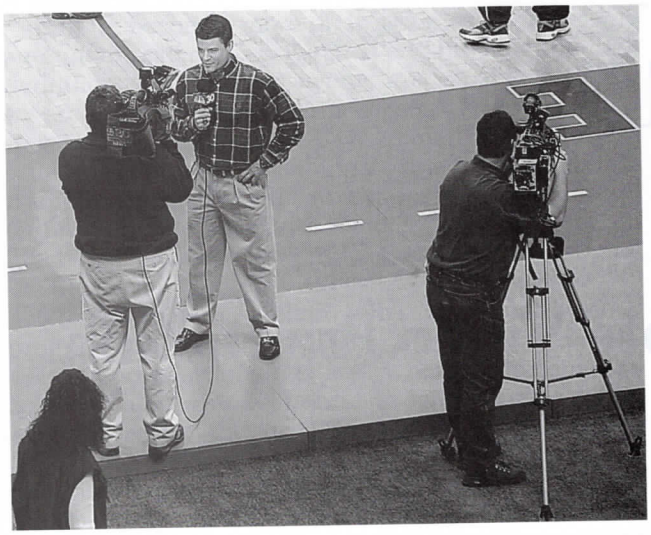

FIGURE 5.17-1 Handheld camera operator and talent doing a "stand up." Tripod-mounted camera on the right is shooting cut aways.

signal using a *telecine* machine for integration into the newscast.

With the advent of electronic cameras and recorders, producers immediately took them outside of the studio for remote production. As the cameras became smaller and more reliable, they were placed in service for news gathering by the broadcast industry, and the term *electronic news gathering* (ENG) was born in the early 1970s. ENG is typically a "shoot it as it happens" activity. Crews are minimal, retakes are few, and time constraints are tight. The ENG category is defined by the lack of control the production crew has over the subject of the story. As a result, ENG equipment must be adaptable to function in a variety of climatic, shooting, and lighting situations and must be able to do so with battery power.

Today, an ENG shoot usually involves a *camera operator* (or *shooter*, as they are known in the news business) and a *reporter*, as shown in Figure 5.17-1. Sometimes an *audio operator*, who handles the audio portion of the shoot, will be part of the team, as shown in Figure 5.17-2. If the assignment is a news feature part of the production of a larger show, a producer an assistant, often called an *associate producer* (AP), will orchestrate or direct the shoot.

On ENG shoots, a camera operator will often bring the tape back to the station where an editor turns the raw footage into a one or two minute story. Sometimes, especially if the story is a big one and will demand more airtime, the reporter might direct the editing process. In many stations, the camera operator puts on an editor's hat back at the station and edits the piece shot in the field.

Live Reporting

To provide the capability for immediate (live) reporting from the field, a mobile microwave link is used to send the remote program back to the studio. The microwave equipment, with an antenna mounted on a hydraulic mast, is usually installed on an ENG truck or van (see Figure 5.17-3), which may also be used for transporting the other ENG equipment. The relay point for the microwave link is often on a tower or high building at the studio center. Alternatively, to provide greater coverage, it may be separately located on the station's transmitter tower, which may be used as an intermediate relay point with a further microwave or fiberoptic link to the studio. Both arrangements for microwave links are discussed in the chapter.

Multi-Camera ENG

Multi-camera ENG shoots are possible and would involve multiple trucks, each feeding a single camera via multiple microwave paths back to the TV station. There they are fed through frame synchronizers so they can be switched and mixed into a complete show. Some ENG vehicles have video switchers

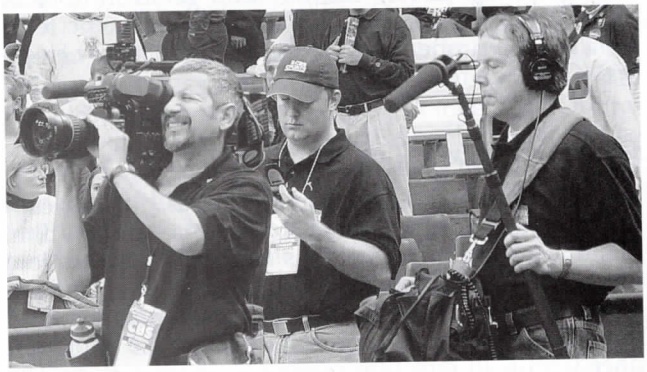

FIGURE 5.17-2 Camera operator, audio operator, and associate producer (AP; center) to direct the activities.

FIGURE 5.17-3 Typical ENG microwave van. (Courtesy of Frontline Communications.)

...s so multiple video and audio sources can ...d by a single truck.

...necessity, ENG is usually produced with a ...era, often handheld, and with heavy use of ...ght and minimal or harsh lighting augmen... shoots allow less-than-perfect framing, ...gle-camera productions, style is limited to ...camera to change the angle. The change ...e or edited in later with the addition of cut... These restrictions tend to produce an *ENG* ...terized by a live or reality feel. This ENG ...often used in drama productions when a ...wants to evoke a feel of live action with a ...mediacy and importance. In that case, the ...may in fact be part of a more elaborate EFP ...studio production with multiple cameras. ...should not be confused with the real use of ...ote category.

...the Range—SNG

...microwave links are generally limited to ...with line-of-site transmission back to the ...e site. This restriction on range for live ...ering can be overcome by using a truck-...portable satellite link for the ENG camera. ...truck is used to uplink to a satellite for ...program to the studio, then the activity is ...*news gathering* (SNG). Arrangements ...links are discussed later in the chapter.

...Field Production

...on location is not news related, then it is ...ed to as *electronic field production* (EFP). ...aking, EFP refers to productions with ...meras in the field, with the recording ...ed in the camera. Images and sound are ...ed for later post-production. Commer... shows, documentaries, and travel pro... the EFP category.

...where the most important factors are ...e of the content and the portability of ...for EFP the picture and sound qual... values have a high priority, as ...choice of equipment and the style of ...ENG, EFP shoots, at their simplest, ...order, a mic, a camera operator, and ...for the camera. Depending on the ...irements, ancillary equipment such ...more advanced camera platforms, ...mixing, and processing are often ...EFP shoots have much more con... staging, lighting, and artistic elements ...shoot. All of these factors contribute ...e of a typical EFP crew compared to ...-person ENG crew.

...EFP motion picture production that ...c cameras is called *electronic cinematography*. For some applications, particularly for documentaries but also increasingly for drama, high-definition electronic cameras have replaced image capture using traditional 35-mm film cameras. The cameras may be very similar to those used in broadcasting, but the workflow, lighting, and artistic conventions tend to be different and follow the language and workflow of film.

Remotes

When the added capabilities of cutting between cameras, more sophisticated audio systems, and the playback of recorded elements in a switched program are implemented, a level of production is reached that is called a *remote*. Remotes can be live, live-to-tape, or recorded for further editing in post-production. For this type of remote production, multiple cameras, recorders, and a production control area are housed in a vehicle of some kind. Trucks used to facilitate these activities can take many forms, from small ENG vans to large tractor-trailers (see Figure 5.17-4). As more equipment is added, the size of the vehicle to transport it grows. The largest remote trucks top out at 53 feet long with expanding sides ("expandos") on both sides and the rear, and they weigh in at just under 80,000 lb. For the largest remotes or even just the "A" game (the football game that the network selects as the national game), one of these trucks is not enough. Often the graphics, audio, or replay requirements are so complex that they are housed in separate trailers. Remotes can require many trucks tied together to provide the necessary gear and facilities at the site to accomplish the shoot. These types of remotes often require multiple days to set up and, obviously, are more expensive to produce.

ENG LINKS AND BACKHAUL

If a news, sports, entertainment, or other event is to be transmitted live, the signal will be sent from the remote site to the station or network studio or *network operations center* (NOC) via a circuit called a *backhaul*. It could be by *microwave*, *landline*, or *satellite*. A combination of all three is shown in the diagram in Figure 5.17-5. At most sports venues, permanently installed landlines are available. Often a satellite path is used as a backup. Landlines, almost exclusively fiberoptics, provide the best quality and are the most reliable method. The use of landlines requires a common carrier, such as the phone company or other service provider, to have a *point of presence* (POP) at the venue. If none is available at the venue, one alternative is to use a local station's ENG truck to get the signal back to a local TV station's master control and then hand it off there to a long-haul service such as Vyvx or other service provider. In addition, some local stations have their own fixed C-band satellite uplink facilities or a path to someone else's uplink facility. In that case, the ENG microwave truck could be used as a terrestrial link to a satellite uplink.

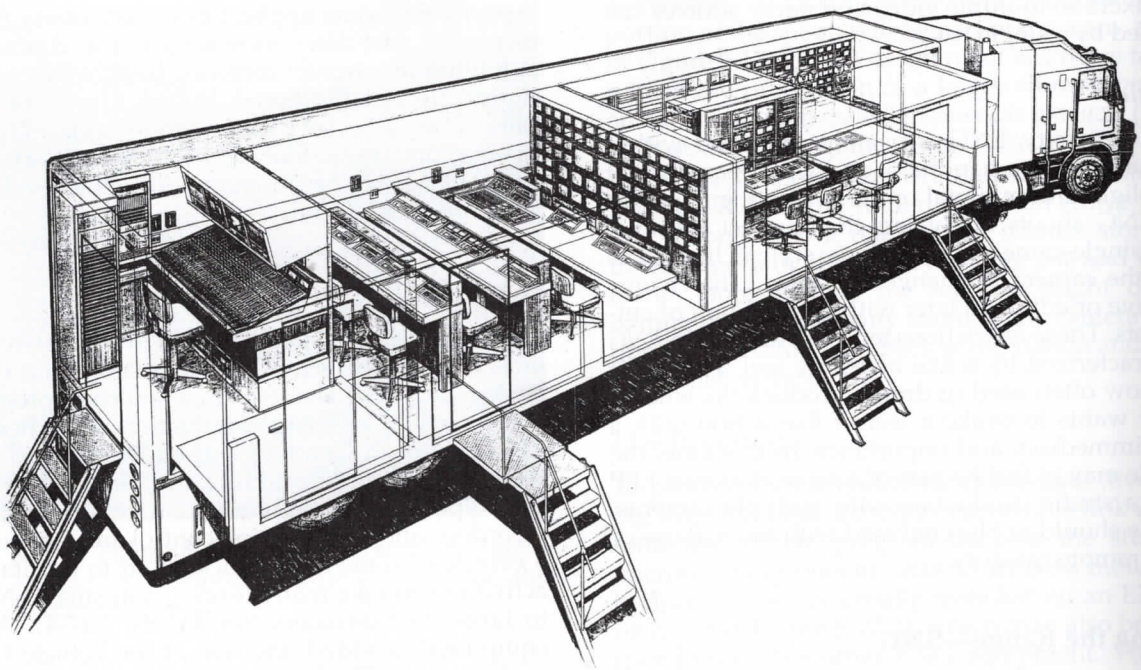

FIGURE 5.17-4 Artist rendition of full-featured, "expando" TV remote production vehicle. (Courtesy of Wolf Coach.)

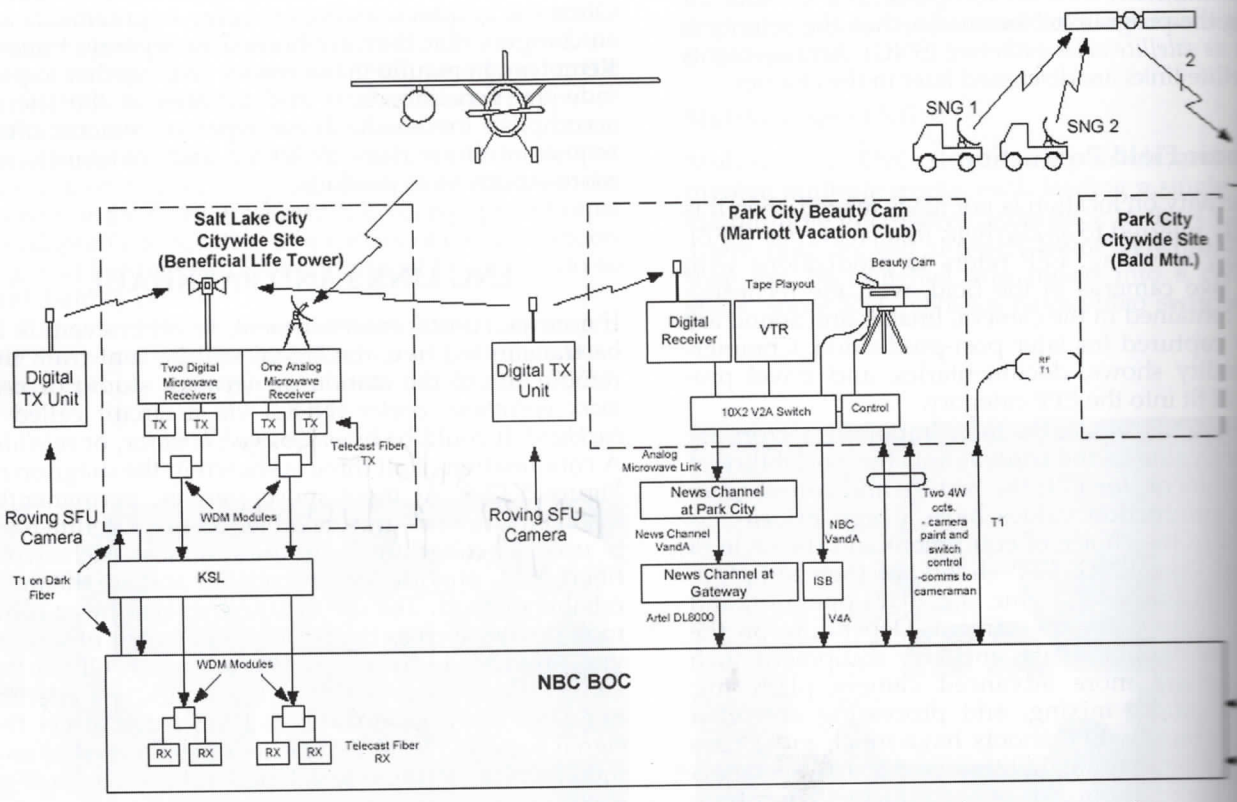

FIGURE 5.17-5 Diagram of complex interconnection system for multi-camera, multi-venue production at the 2002 Winter Olympics in Salt Lake City. (Courtesy of NEP Broadcasting.)

main and backup backhauls a wide combi- of paths and links may have to be used. The path for a live news link (ENG) is via micro- If the venue is outside the range of the sta- microwave receive sites, then a station with a truck might use it to get from the venue to tion via a satellite uplink, or SNG, truck. microwave frequencies may already be in a metropolitan area, a check on frequency tion with the local Society of Broadcast Engi- SBE) frequency coordinator (http://sbe.org/ php) is advisable to make certain that nce can be avoided. Often, cooperation stations is needed to ensure interference- ration for special events.

ishing a Microwave Path

ruck operator has determined that the mast ly raised, the microwave dish at the top is ward a receive site. The truck will then con- tion operator responsible for establishing If the operator is expecting a feed and the receive dish is not already in use, then the antenna will be aimed in the general the truck awaiting contact from the field 5.17-6). Even if the station is expecting a perator still should contact the station ering up to confirm that plans have not Once powered up, the truck will pan the nna until the best signal is received at the Then the receive end will also pan the receive ptimize the signal. This might go on for a ns until the best, most reliable signal is

path will end up bouncing off one or such as hills and buildings. Sometimes e will find that the best reception from from a direction far different than the bearing. Although this usually works for tion of an ENG shoot setup and on-air not recommended if the path is required ds, especially if the entire show, not just a news show, is counting on that path. A might work earlier in the day, but not spheric conditions change or buildings the signal heat up or cool down. A 30 icrowave shot will typically have a line- ss of approximately 130 dB. Any reflec- bstructions will obviously lower the ility of a path. Where a single hop is not ntervening terrain, a multi-hop micro- be used, as shown in Figure 5.17-7.

to ENG operations are SNG remotes. ference is the signal path to the station. microwave path between truck and sta- is uplinked to a satellite. In the case of usually a satellite that operates in the

FIGURE 5.17-6 ENG remote-controlled receive antenna on tower.

FIGURE 5.17-7 Microwave relay facility on mountain top.

FIGURE 5.17-8 SNG uplink vehicle. (Courtesy of Frontline Communications.)

Ku-band. SNG or satellite uplink vehicles require several hundred pounds of additional weight in the form of a high-gain 2 to 3 meter transmit dish, more complicated radio frequency (RF) distribution paths, and antenna controller hardware. Satellite transmitters require more power, with maximum power for Ku band operations around 300 watts *versus* 20 watts for ENG. This additional hardware requires a larger and heavier truck than for ENG, as shown in Figure 5.17-8. The Ku-band satellites used in the United States have a directional pattern that covers most of the continental United States or a "conus" pattern, as illustrated in Figure 5.17-9.

In addition to being expensive and complex, satellite uplink operation is also potentially dangerous. It is not something to be undertaken without proper training. Many transmitters have lethally high voltages and the current to cook as well as shock. But, more dangerous, because it is easier to get in its way, is the RF power. Hundreds of watts of RF power can be coming out of a transmitter and channeled down a waveguide only a centimeter or two wide. Waveguides can spring leaks. If the transmitter is on long enough, the leak will manifest themselves by heating up the area around the leak. Leaks are found by checking for hot spots only after the transmitter is turned off. If a waveguide is dangerous, then so, too, is what is reflected off the dish. A satellite dish takes the power that the waveguide delivers and directs that energy in a single concentrated high-power beam (transmitter power times the antenna gain) that may be the equivalent of hundreds of thousands of watts. This amount of power is extremely dangerous to any human being within that beam.

Satellite transmission levels are at least 50, and usually 100, times more powerful than any ENG microwave transmission. Whereas microwave shots can intentionally bounce their signals, satellite uplink transmissions must be aimed directly at the satellite. A Ku dish can emit enough RF energy that it is unsafe within almost 200 meters from the dish. The dish must not attempt to shoot through any obstructions. Shooting through leaves can scatter RF energy, so instead of illuminating the intended satellite the signal may be hitting many obstacles. A Ku dish with no scattering has a beam width of hundreds of miles when it reaches the satellite. A 2° spacing between the

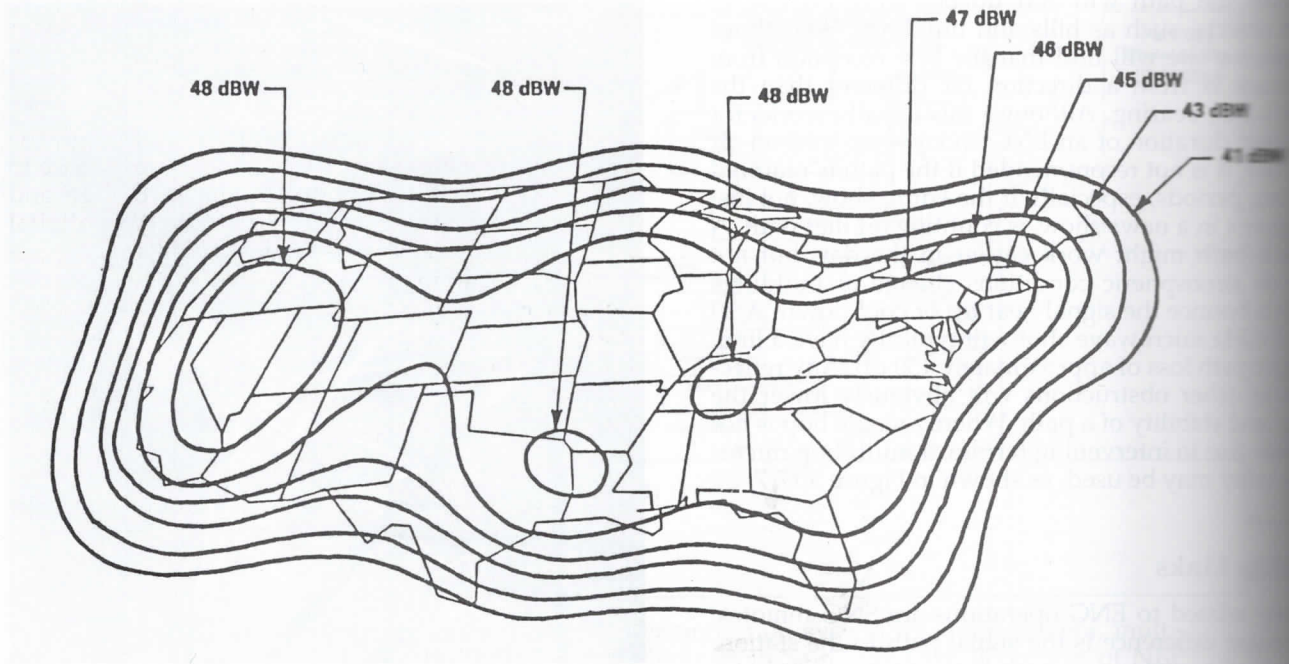

FIGURE 5.17-9 Example of "conus footprint" coverage pattern of Ku-band satellite used for SNG operations.