

FEBRUARY 1971

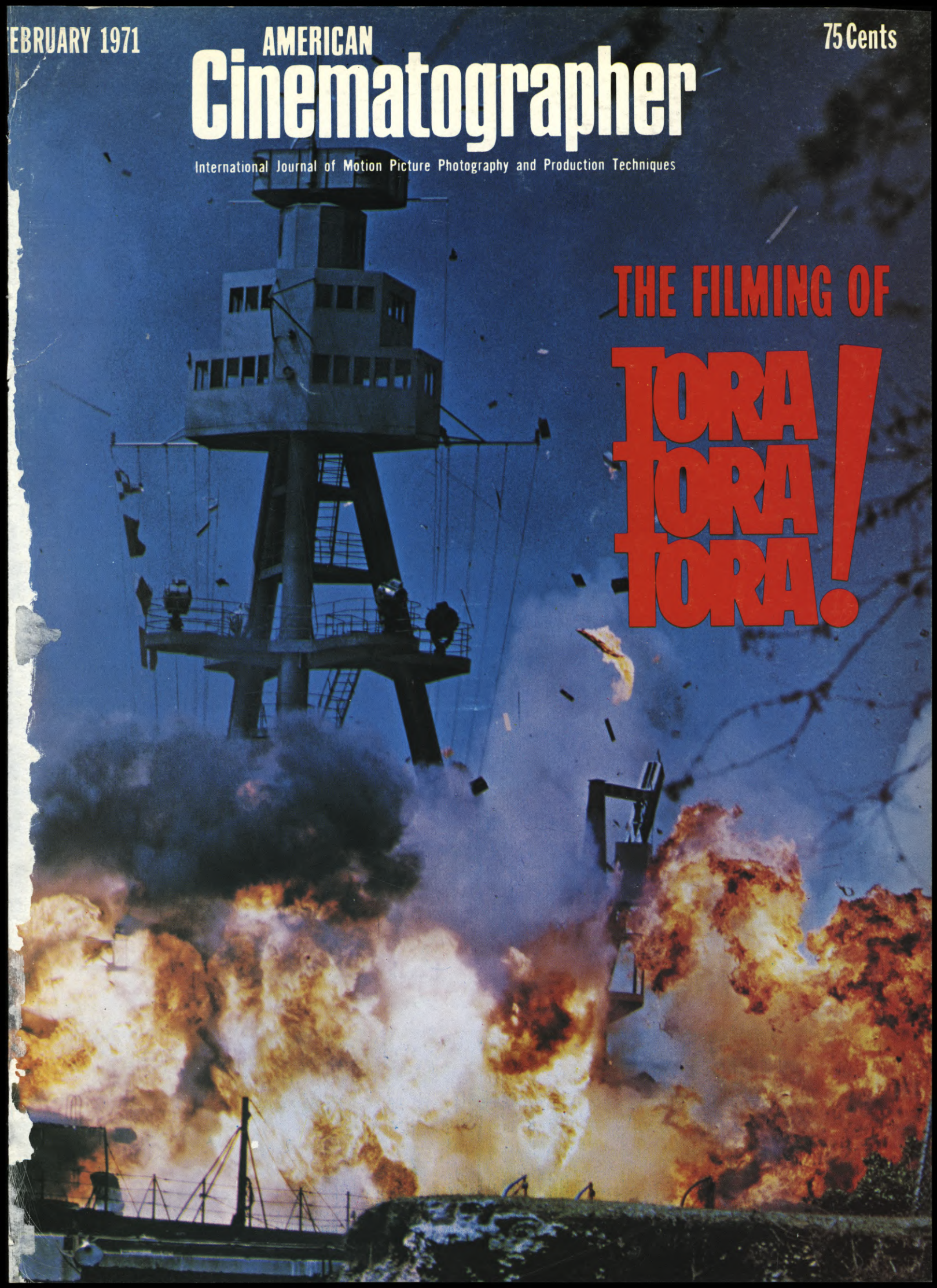
75 Cents

AMERICAN Cinematographer

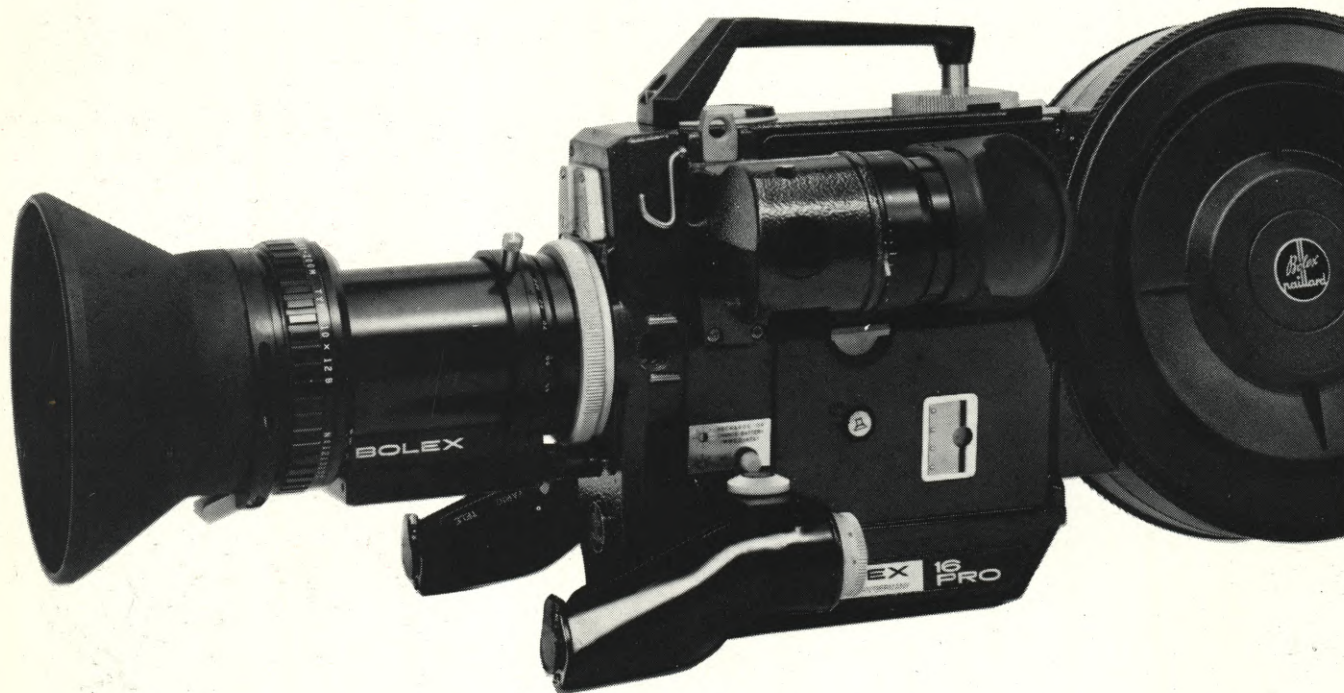
International Journal of Motion Picture Photography and Production Techniques

THE FILMING OF

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TORA!
TORA!**



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- Shoot animation.
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- Take exposure readings through the lens.
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- Zoom manually.
- Pushbutton power zooming.
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- Pushbutton power focusing.
- Focus manually.
- Add automatic focusing of lens.
- See diaphragm opening in viewfinder.
- Switch instantly from groundglass to clear field while viewing through the lens.
- See area surrounding the field covered by the lens.
- Have an uninterrupted view through viewfinder without a "black-out" at the end of the take.
- Shoot without creating blank frames between scenes.
- Shoot without overexposed frames at beginning and end of scene.
- Open and close lens diaphragm by pushing micro switches.
- Control all camera operations from the two handgrips.
- Cut partially exposed film in camera.
- Shoot from shoulder or tripod.
- Fade out by pushing button.
- Fade in.
- Produce lap dissolves.
- Rewind film without covering lens.
- Film in reverse.
- See condition of battery on camera.
- Switch from manual to automatic diaphragm setting while filming.
- See whether or not there is sufficient light.



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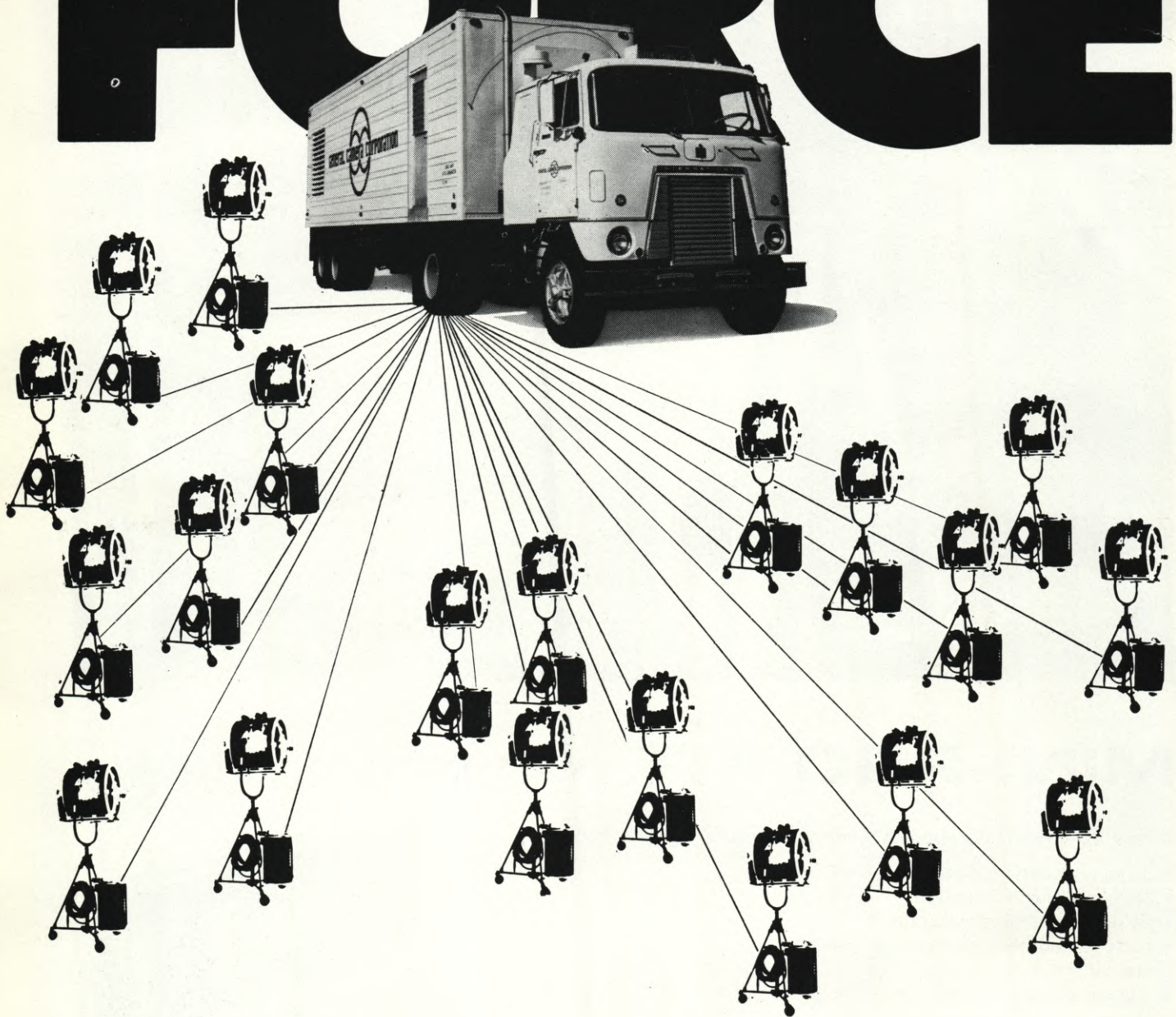
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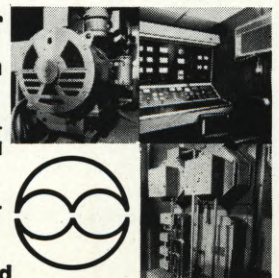


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AMERICAN Cinematographer

International Journal of Motion Picture Photography and Production Techniques

FEBRUARY, 1971

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It took months of dedicated effort and incredible coordination to re-stage and photograph the disaster that took place at Pearl Harbor on a quiet Sunday morning in December, 1941

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A top expert in the field of film "magic" tells how miniatures and front-projection vastly extended the scope of the production

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... or "Through the hoop with Gun Camera"—a bit idiotic from the dramatic standpoint—but technically rather interesting

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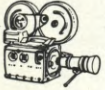
ON THE COVER: A full-scale mock-up of the mast section of the *USS Arizona* is racked by tremendous explosions in an all-too-real recreation of the Pearl Harbor attack for the 20th Century-Fox production of "TORA! TORA! TORA!".

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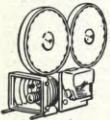
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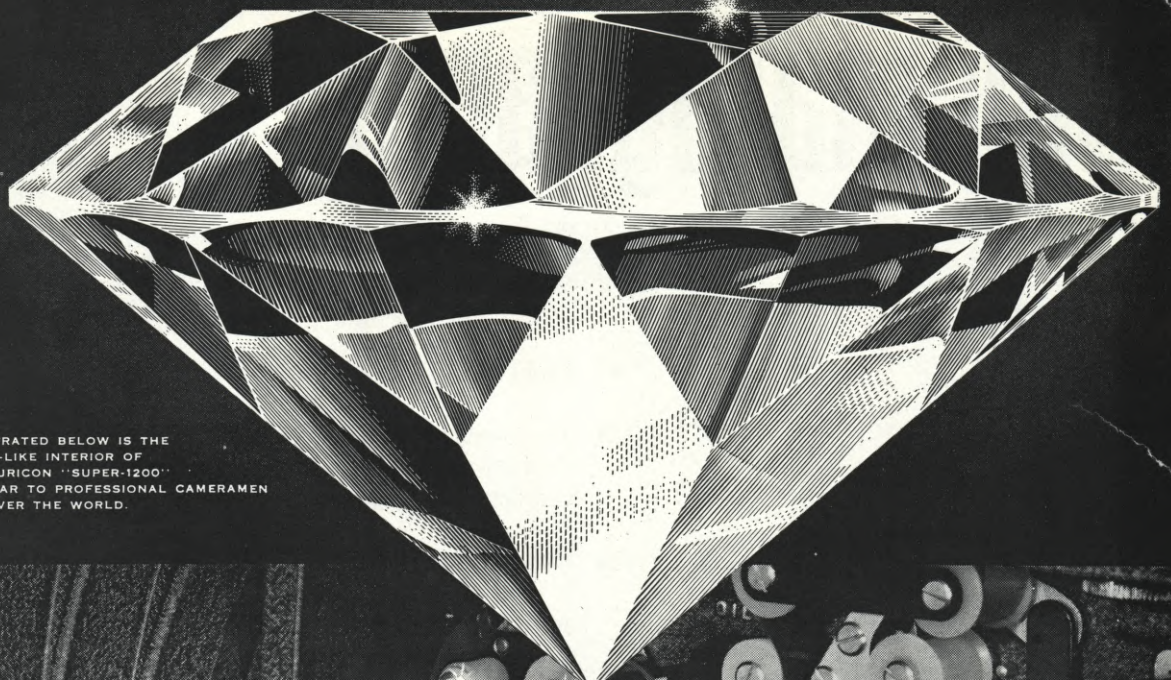
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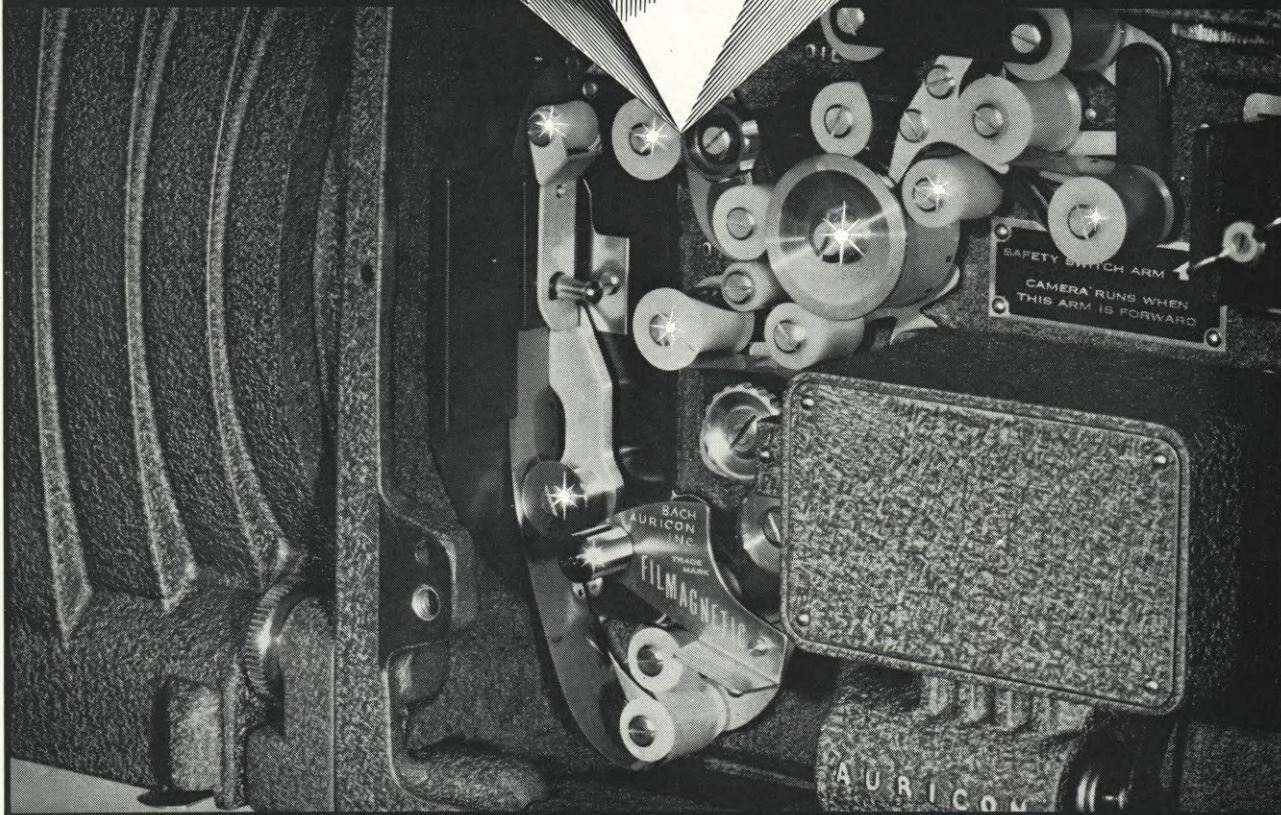
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November 24, 1970

Mr. Jack Hopper, Vice-Pres. & Gen. Mgr.
Southwest Film Laboratory, Inc
3024 Fort Worth Avenue
Dallas, Texas

Dear Jack:

" TELL IT LIKE IT IS "...For years I have spread good word about Southwest Film Laboratory and its personalized service. This opinion, as on many occasions, was again confirmed last evening.

Yesterday afternoon, the answer print of " PURSUIT OF THE PAUXI-PAUXI " was taken out to the airport and shipped by Air Express. As of 11:00 p.m. last night the answer print had not arrived in Houston. I contacted Charlie Floyd at his home to learn what might have happened to my shipment. Floyd gave me George Keen's home phone number since Keen lives just five minutes away from the laboratory.

I called George at home, explained the importance of my having the answer print in my hands before 9:00 a.m in the morning, and George Keen then drove to the laboratory, phoned back to me the air-express way-bill number and initiated a tracer with the express office in Dallas. Keen found out that the shipment was on a " MILK RUN " to Houston, arriving at 2:00 a.m and relayed this information.

Jack, I don't think any laboratory in the country would have given this kind of service. My thanks to you, George Keen and Charles Floyd, and to a fine film laboratory.

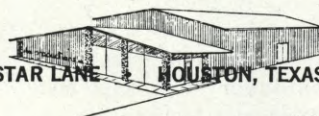
Cordially,

MFC FILM PRODUCTION, INC

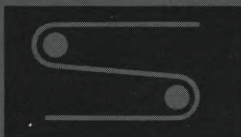
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WHAT'S NEW

IN PRODUCTS, SERVICES AND LITERATURE

NEW ELECTRONIC TECHNIQUE FOR PRESENTATION OF CLASSIC SILENT FILMS ON TELEVISION

The development and application of a unique new electronic technique for the presentation of classic silent motion pictures has been announced jointly by Harold Goldman, president of Gold Key Entertainment, Inc., Beverly Hills-based production/distribution company, and Joseph Bluth, president of the Vidtronics division of Technicolor.

The process which allows silent films originally shot at a different frame speed to be exhibited for the first time on television without exaggerated movements or jerkiness has been utilized to produce a two-hour TV special of the MGM silent feature, "The Big Parade".

In making the announcement, Goldman, whose company will produce the unprecedented series, stated, "Through electronics, the classic films made during the golden age of silent features will take on a new dimension. These memorable films, produced by Metro-Goldwyn-Mayer, will now be brought to today's audiences with a contemporary look. These films have been referred to as works of art, and we are proud to join with Technicolor and MGM in this series which will enable these pictures to be seen as they were originally presented."

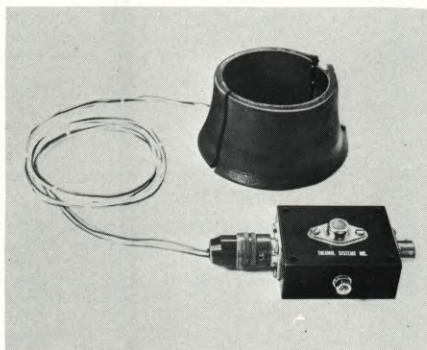
"The Big Parade", the first in the series, starred John Gilbert and Renee Adoree, and was directed by King Vidor, who will be interviewed on the initial program by Arthur Knight, noted motion picture critic. On subsequent programs, production personnel and performers will be interviewed by Knight, as well as by other noted film critics who have been invited to moderate later programs in the series. These specially produced live interview sequences will be interspersed into the film.

In addition to the speed change, the picture eliminates some of the outdated titles and legends and has been tinted to accent and enhance certain scenes. Added sound, and music, narration where needed, will be utilized in order to give a contemporary feeling to the programs.

Noted motion picture producer Gordon Oliver acts as host for the first program. Mort Zarcoff who created the format, is producer/director of the live segments for Gold Key. Post-production

of the films is by Technicolor's Vidtronics Division which developed the revolutionary projector during the past year. Other MGM titles to be included in the series are "Flesh and the Devil", "The Unholy Three", "Our Dancing Daughters", "Greed", "The Crowd", "The Four Horsemen of the Apocalypse", "Monster", "Mysterious Lady", "Taxi Dancer", and "Mr. Wu".

The initial screening of the film and demonstration of the process took place at the Vidtronics headquarters in Hollywood in mid-January.



THERMAL SYSTEMS INTRODUCES NEW LINE OF PRECISION ETCHED-HEATER SYSTEMS

Introduction of a new line of highly accurate heating and temperature-controlling systems for precision optical and critical instrumentation has been announced by Thermal Systems Division of Axial Corporation, Los Angeles, Calif.

Named Conformo-Blanket, the new system features etched foil heating elements laminated together with an integral temperature sensor in an insulating blanket which conforms to the surface of the device being heated. Control of the closed-loop systems is by an external SCR proportional controller.

Thermal Systems, pioneer of the etched heater technique, explained that the pattern of the heater element is computer-designed for the particular application with path width and density of paths used to vary heat from area to area depending upon mass and other configurational variations of the device being heated. Applied heat can be from as little as 0.01 watt per square inch to as high as 80 watts per square inch.

The company said that once the

pattern has been designed it is reproduced in etched foil on a silicone rubber substrate in a manner similar to printed circuit board production.

The heat sensor, a positive temperature coefficient platinum wire, runs integrally with the heating element throughout the pattern providing an accurate heat summing function. The heater, sensor, and a light-weight, closed-cell-foam insulation layer—which reduces power requirements—are laminated together to form the contour-fitting blanket.

The company said that the Conformo-Blanket technique has been engineered to allow its use in a wide variety of applications with various wattage, accuracy, size, and shape requirements. The first Conformo-Blanket system is in an airborne infrared system where maintenance of optical alignment in a rigorous environment is vital. Accuracy of this system is $\pm 1/2^\circ\text{F}$.

TECHNICOLOR FORMS ITALIAN AUDIOVISUAL EDUCATION SUBSIDIARY

Technicolor, Inc., has announced the formation of an Italian audiovisual education subsidiary, Technicolor Audiovisivi S.p.A., Rome, and the appointment of Dr. Vincenzo Labella, a writer, producer and director of documentary films, as vice president and general manager of the new unit.

In a joint statement from Hollywood by William E. McKenna, Technicolor board chairman, and from London by Harry Saltzman, chairman of the executive committee, the company said Technicolor Audiovisivi plans to provide educational materials and services, including the development of integrated curricula emphasizing audiovisual media. It does not intend to become a maker of films, but will promote independent production.

The new subsidiary will distribute and ultimately manufacture Technicolor's cartridge film projectors, now made in the U.S. and marketed world-wide by the parent company's Commercial and Educational Division. It also will load 8mm films into Technicolor continuous-loop cartridges.

Dr. Labella, Technicolor Audiovisivi's chief, holds advanced degrees both in law and in literature. A former radio and television journalist, and author of a book on Vatican art, he commenced his documentary film career in 1954. His prologue to the

Continued on Page 188

Sticking to a producer's schedule is part of ordinary lab service. Sometimes the schedule blows up. Then you need **extraordinary** service. Cine-Graphic service.

Like when our phone rang early on a Tuesday. The producer who hollered for help is not exactly a giant of the film industry. Just a little guy. We had helped him plan a production schedule. A tight one, but perfectly practical.

Then the client's Big Boss asked for release prints "a little" ahead of schedule. Five days ahead . . .

We got originals and a magnetic track at noon. At 3:00 a.m. four release prints were in the can. His sound mix and optical track had been completed while

all the other work was in progress. The prints were fully corrected for color and density. Titles included aerial-image footage from our Oxberry. Every optical effect originally planned was on film.

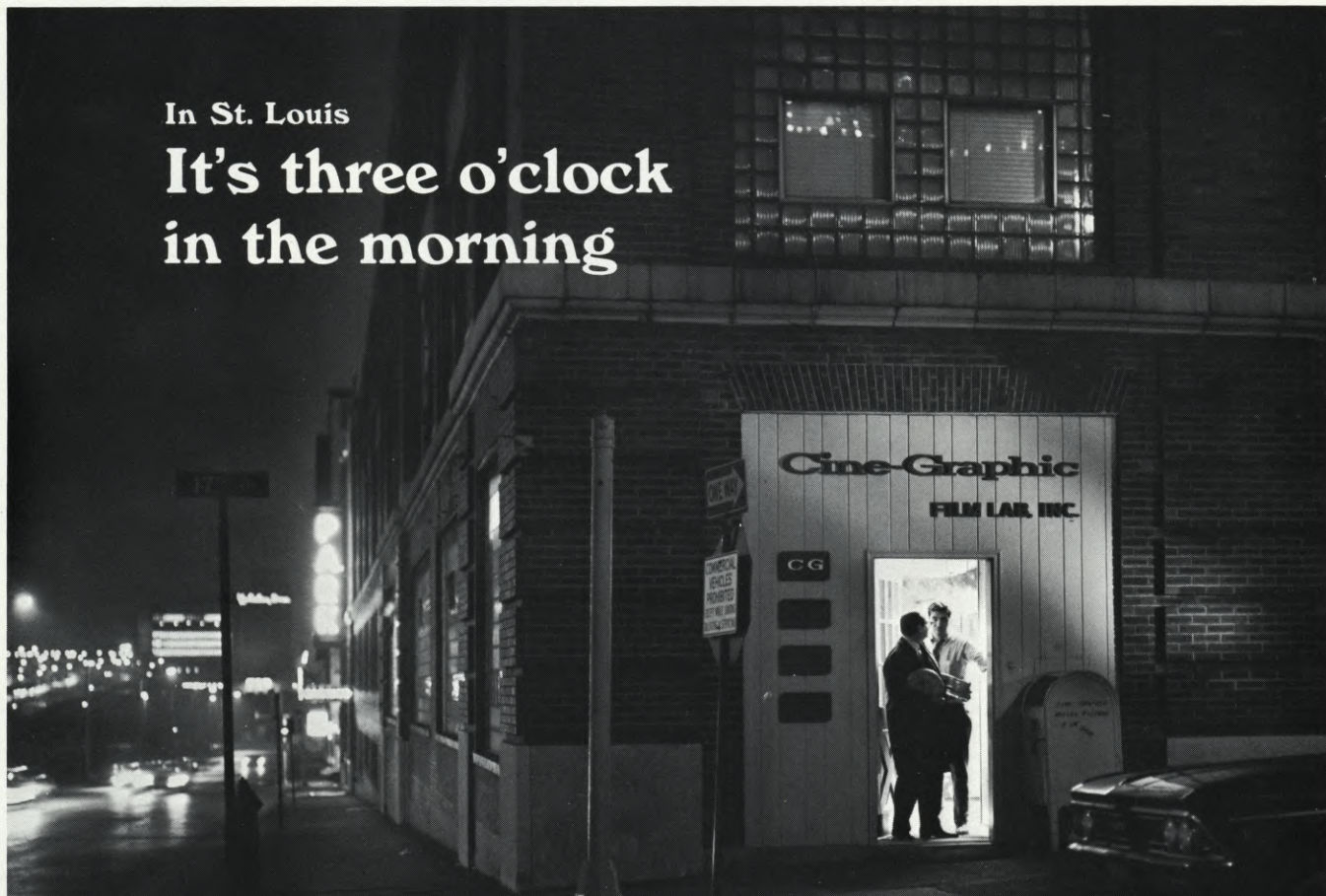
At 3:01 a happy filmmaker was driving toward Arkansas.

More than 99% of our work at Cine-Graphic moves through the lab on a quick but comfortable schedule. But when minutes matter more than money, we really get moving! Even for the "little guy."

We'll give your next production the same kind of extraordinary attention. Write for details and prices. Or phone Bill Schmidt or Duke Uding.

In St. Louis

**It's three o'clock
in the morning**



**The job we received Tuesday
noon will be screened
at lunchtime Wednesday
in Fort Smith, Arkansas**

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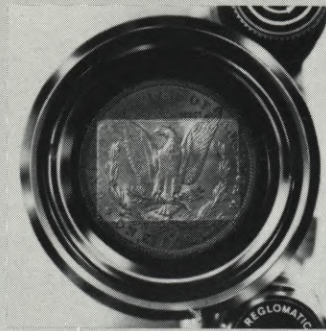
P.S. When we get a rush job, we rush very carefully

Here is the new Beau

Variable-speed electronic zoom



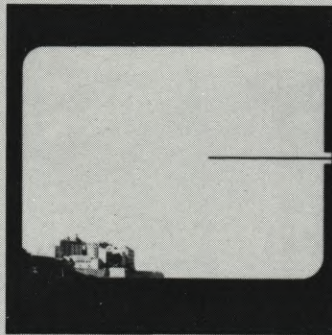
New! Vary the duration of your zoom shots anywhere from 2-12 seconds...with an 8:1 ratio between maximum and minimum focal lengths. You will enjoy perfectly smooth action from 8 mm wide-angle to 64 mm telephoto with the mere touch of a button. And you can stop just where you want to with Beaulieu's inertia-free zoom system.



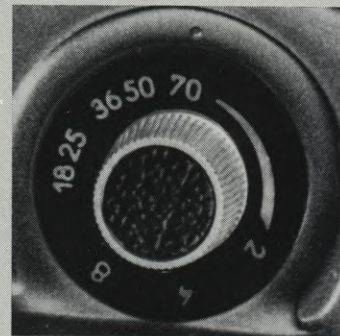
Point-blank-range macrocinematography

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New! You'll see the actual image you will be filming through the giant viewfinder...enlarged to cover your entire field of vision. Spot every tiniest detail thanks to the brilliant virtual image in Beaulieu's reflex viewfinder.



70 filming speeds

New! Step up your filming speed to 70 fps (for slow-slow motion effects) or down to 2 fps (for filming a static subject under very poor light conditions). Change filming speeds from one extreme to the other or anywhere in between... while you are filming.

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The diaphragm setting ring adjusts automatically to the slightest change in light intensity and unfailingly selects the ideal aperture. Beaulieu's automatic exposure system can be disconnected and for special effects you can manually select your own aperture. Other Beaulieu "plus" features include:

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- retractable ground-glass focusing screen...
- frame counter and footage counter.

And there is much moreget all the facts on the Beaulieu 4008ZM, the Ultimate Super-8! See a demonstration at your finest camera store or write Cinema Beaulieu, 14225 Ventura Boulevard, Sherman Oaks, California 91403. We will send you a handsome full color 16-page brochure on the new Beaulieu 4008ZM.

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President, Arthur Florman

Needless to say...

Everyone knows the old cliché, "needless to say—". It stands to reason that if it is needless to say something, then why say it? Yet habit is so strong, we go on saying and writing that unnecessary introductory phrase!

Well, then, needless to say, one of **MPL's** valuable pieces of equipment is our solid state Color Film Analyzer. The use of this Color Analyzer is the one and only way you can depend on getting your films printed

to color perfection.

There is nothing new about having an Analyzer, for they were first put into use almost twenty years ago. Useful as the early Analyzers were, maintenance problems made it difficult to count on the Analyzer as a continuously useful piece of equipment.

However, when, at last, the solid state Color Analyzer was finally produced, for the first

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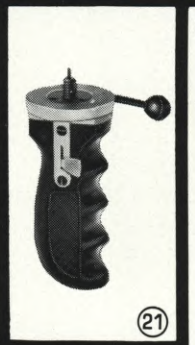
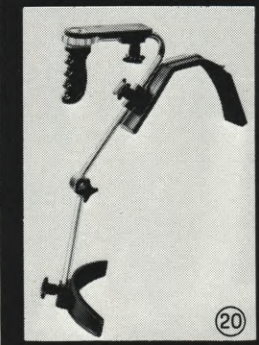
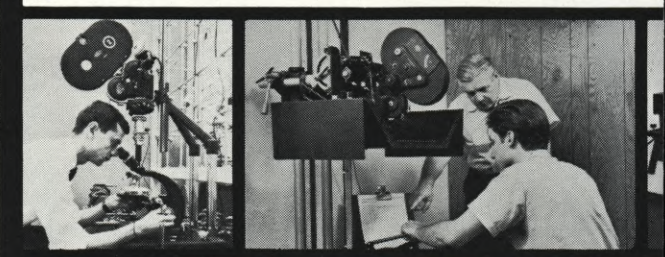
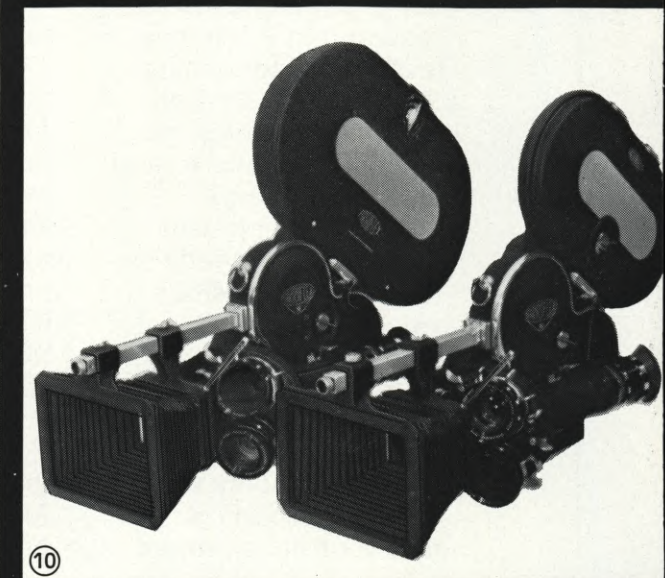
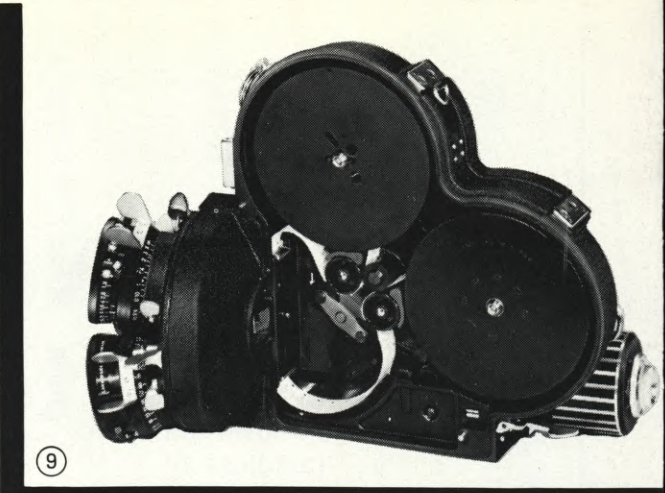
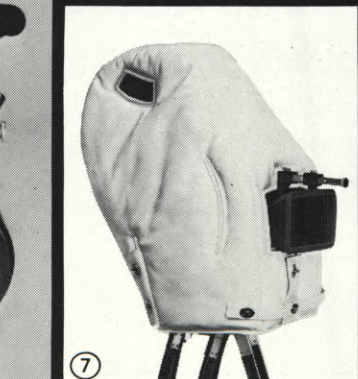
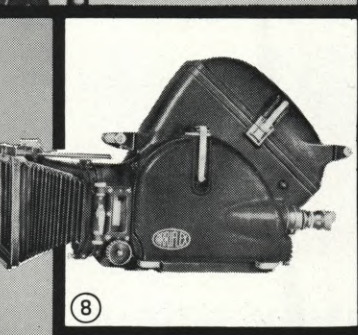
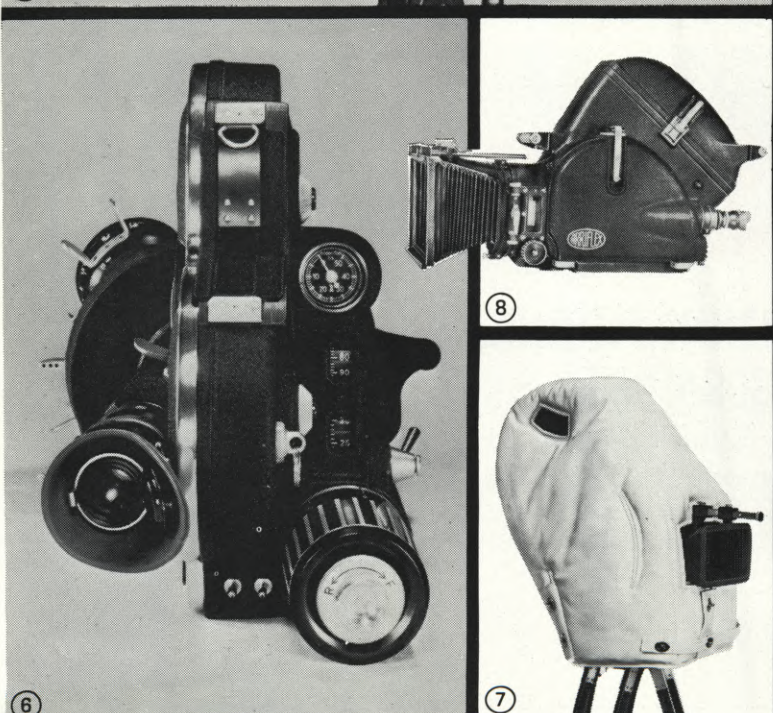
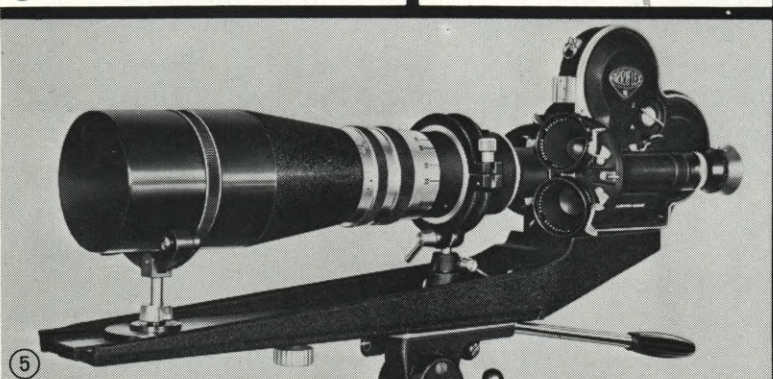
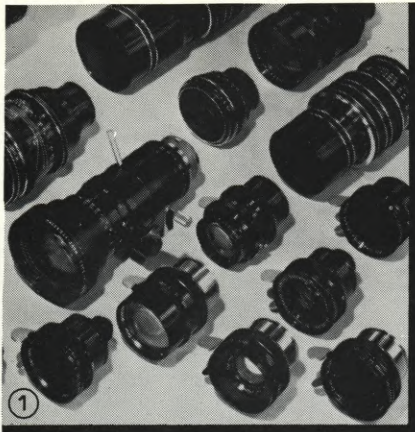
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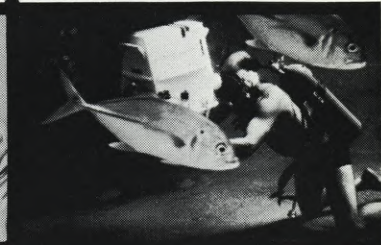
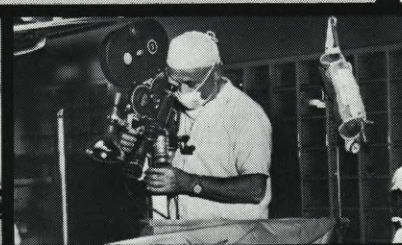
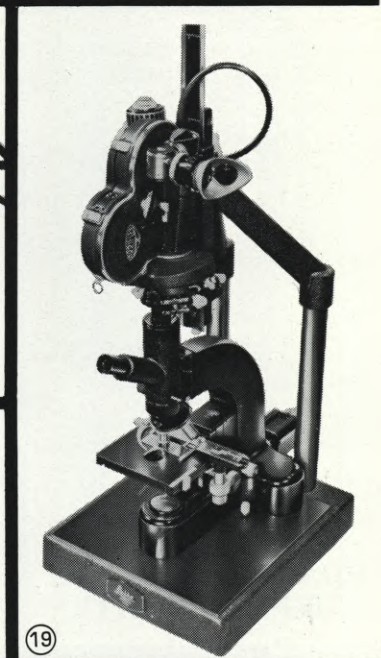
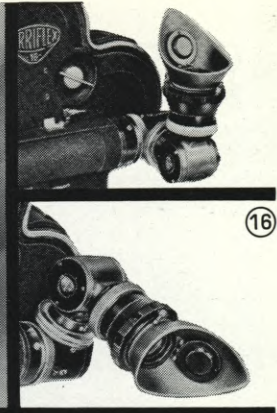
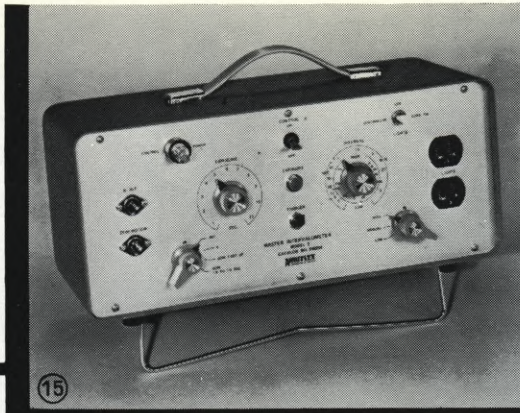
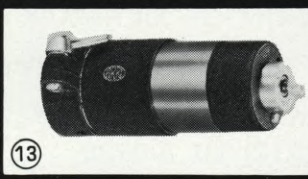
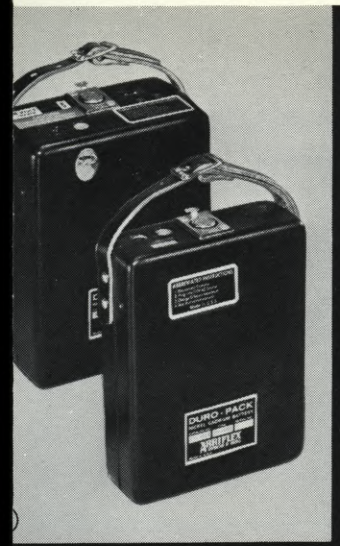
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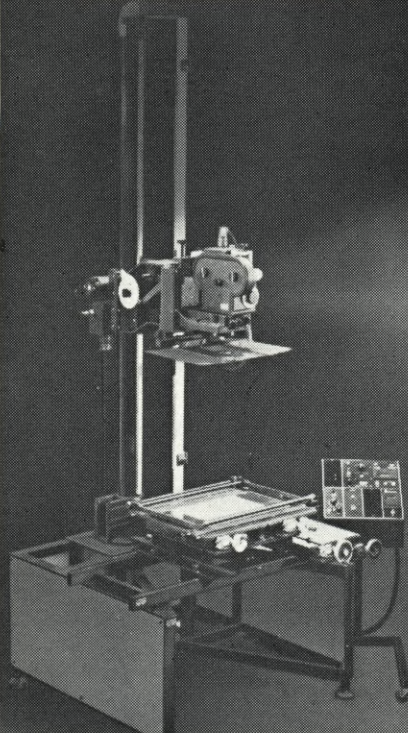


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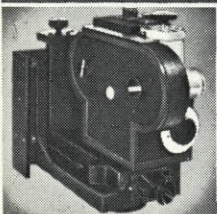
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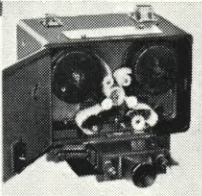
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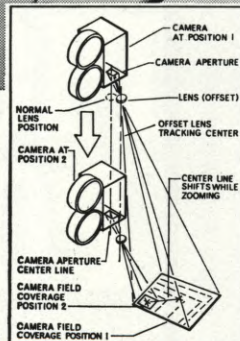
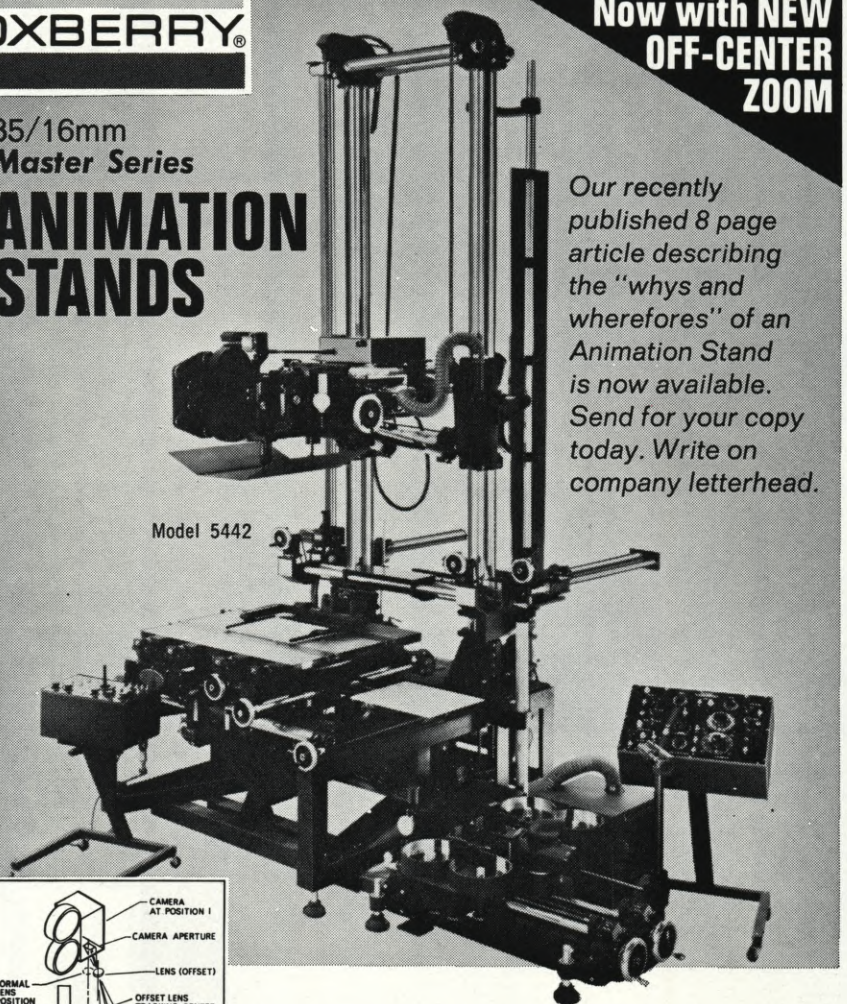
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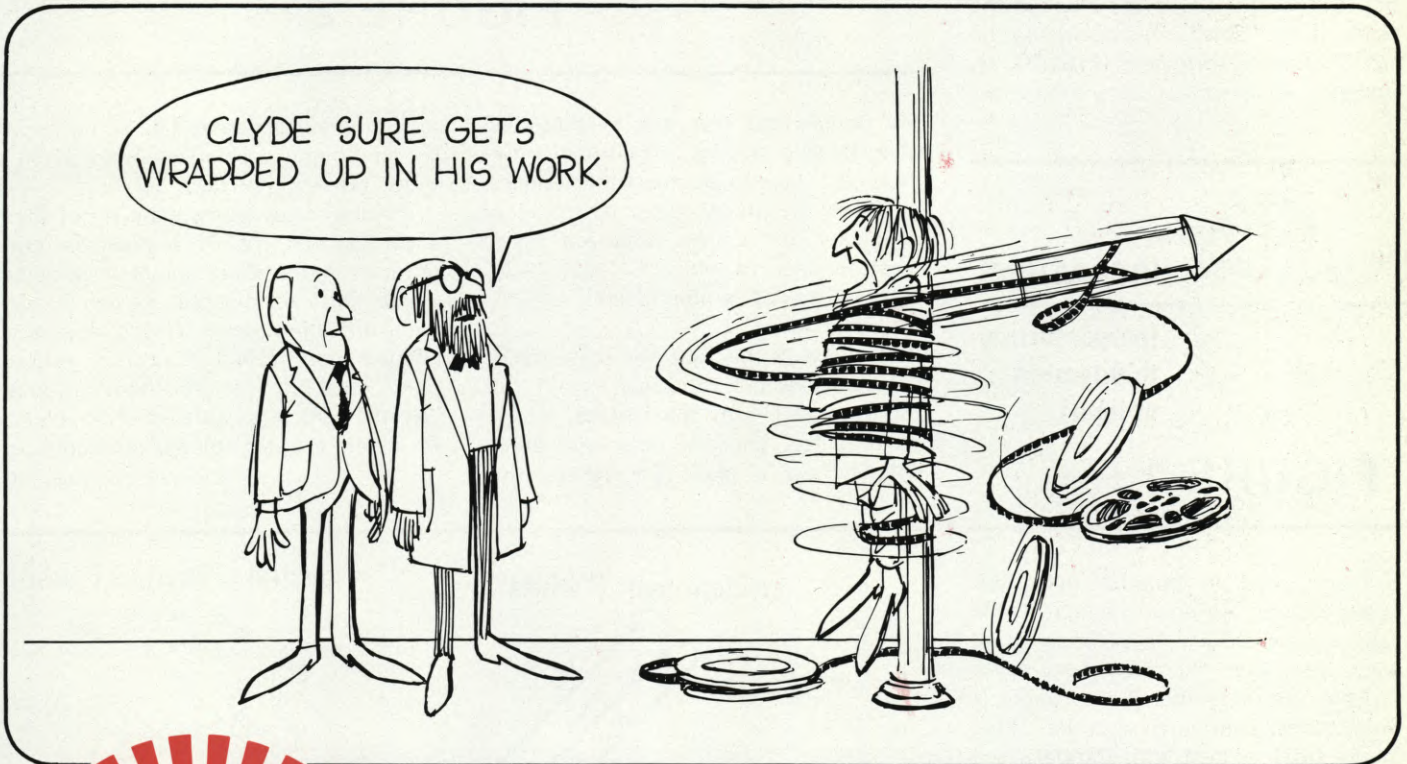
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CINEMA WORKSHOP



By ANTON WILSON

POLARIZING FILTERS

Most cinematographers are familiar with the properties of absorption filters used for both black and white and color photography. However, for many, the principle of the polarizing filter is a more esoteric subject.

Light waves pulsate or vibrate in all planes perpendicular to the direction of propagation (FIGURE 1). If, for some reason, these vibrations are cancelled in all but one plane, the light is said to be *polarized*.

A polarizing filter or "polarizer" is constructed of very fine "optical slits" that cancel all vibrations except in the plane of the "slits", thus polarizing the light that passes through it (FIGURE 2). However, in cinematography a polarizer

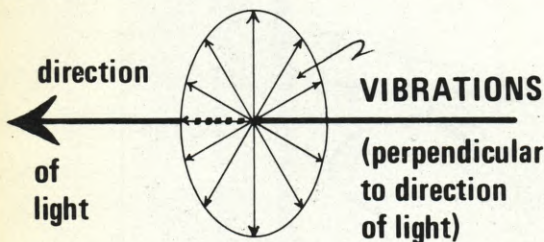


FIGURE 1

is rarely used to polarize light, but rather to filter *out* polarized light. It the light passing through a polarizer is already polarized, the filter becomes a variable absorbing filter. For example, if the polarizer is oriented with the "slits" of the filter aligned with the polarized plane of the incident light, the polarizer has no effect; it allows this light to pass unchanged. As the filter is turned in such a way as to be out of phase with the incident polarized light, the transmission is reduced proportionately until, when the polarizer is 90° out of phase with the incident light, it will cancel the incident light entirely. Thus, if a polarizing filter is 90° out of phase with a polarized source, it will filter out the polarized rays, while transmitting freely any unpolarized rays. (Actually

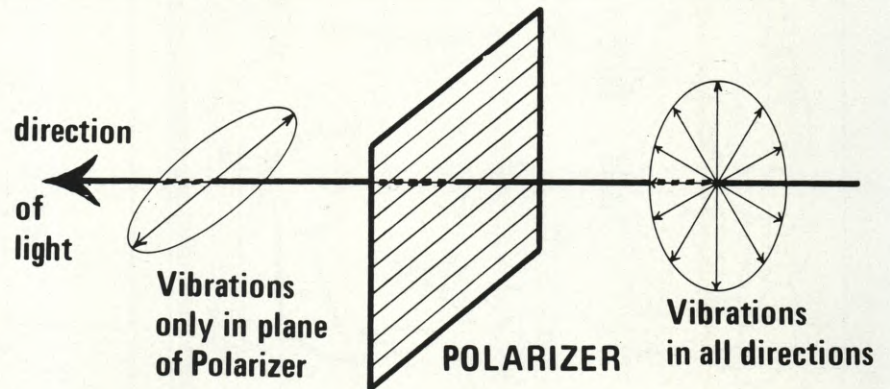


FIGURE 2

the unpolarized rays will be polarized after passing through this filter. However, this has no photographic effect.)

There are many cases where it is beneficial to remove polarized light, most familiar of which is "glare". As light reflects off a non-metallic surface, it is polarized.

Essentially, as the light hits the surface, its vibrations are cancelled except for those parallel with the surface, which are reflected. Thus the reflected light is polarized in a plane parallel to the

reflecting surface, and can be removed by employing a polarizer oriented 90° to the reflecting surface.

Even in cases where glare is not that apparent, the use of a polarizer can produce more vivid colors, especially where most of the objects are in the same reflecting plane. This is due to a phenomenon called "spectral reflection". Most photographic illumination is "white" light; it is made up of all colors. An object appears colored by absorbing

Continued on Page 160

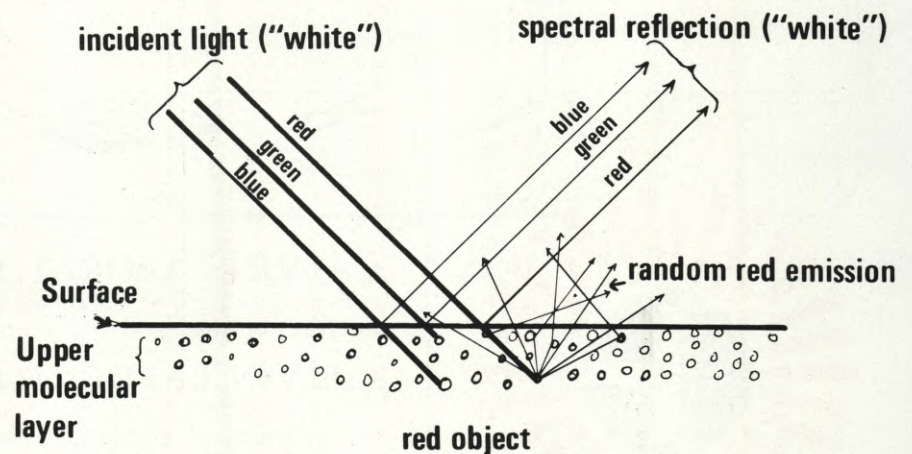
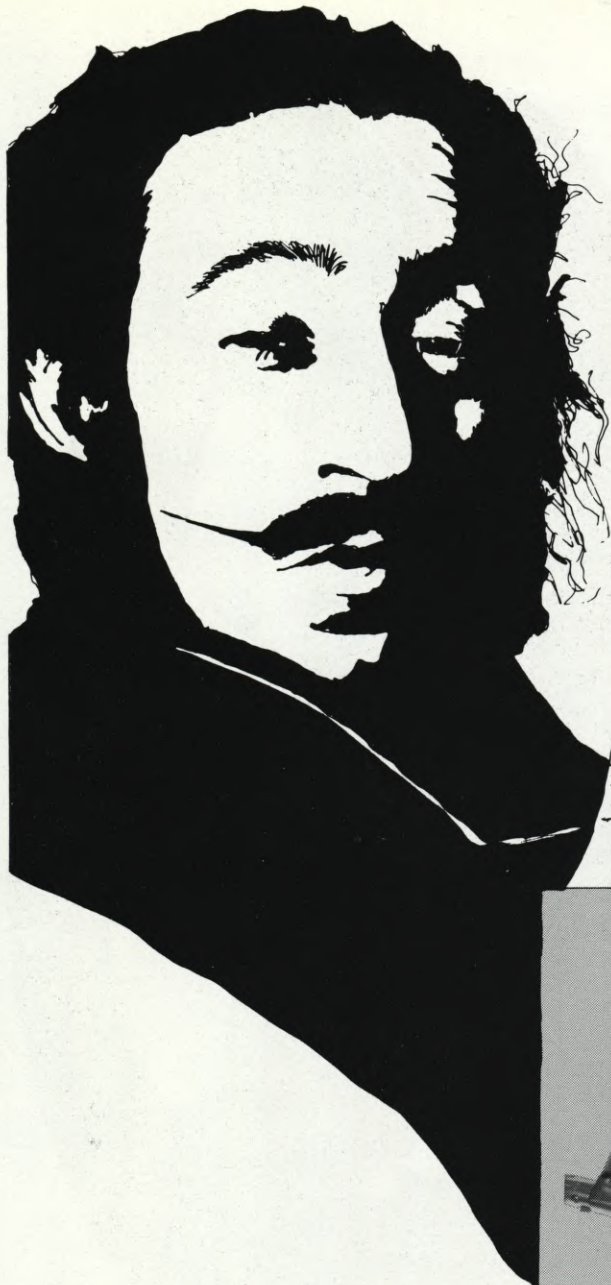
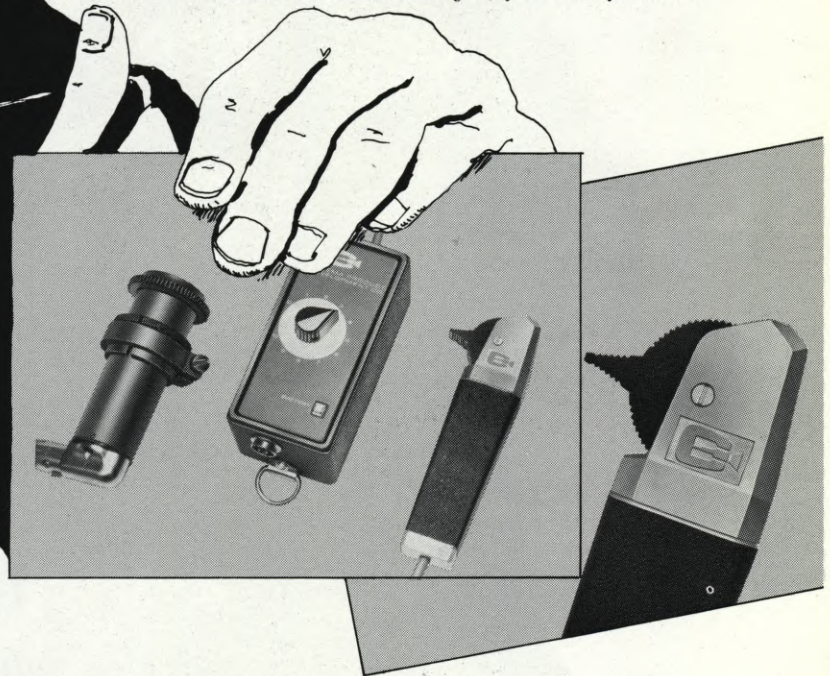


FIGURE 3



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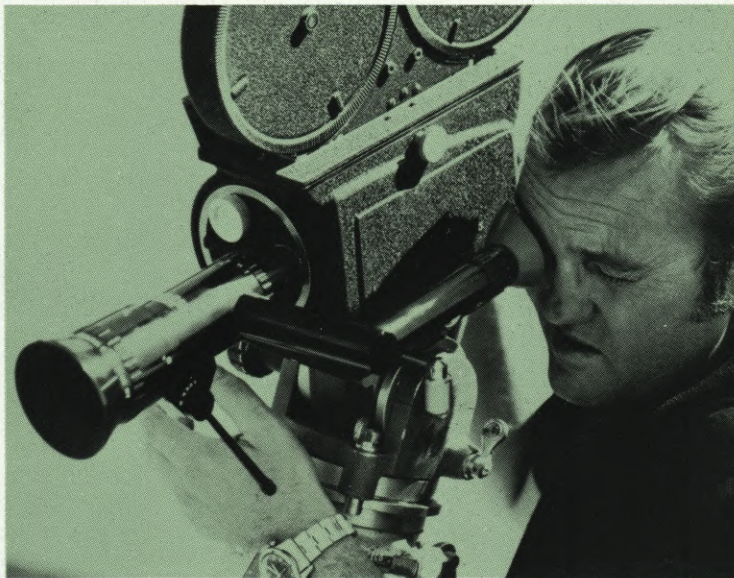
"MONITAL is an unbeatable tool" says GENE BARNES*

I have recently been accused of reversing my decision to use primary lenses instead of relying entirely on "zoom" or variable focal length lenses. I believe the discipline of fixed focal length lenses puts a far greater stress on your entire approach. You think again in film terms. Television brought the zoom lens into being for it helped smooth out the problem of awkward lens flipping for a different perspective. However, in searching for acceptable primary as well as zoom lenses I had encountered innumerable problems of quality, mechanical failure, and inadequacies and finally believed that "they just didn't make them like they used to."

I changed my mind when I tested and used the primary lenses manufactured by Rank Taylor Hobson. These lenses had weight, focusing and iris rings that worked smoothly and stayed exactly where set. It was like being snapped into focus after experiencing a fuzzy nightmare. Encouraged I tested the Rank Taylor Hobson zoom lenses as well. The Monital 17-85 f/2 gave greater definition and clarity than many of the other lenses I had used. Also, smoother action and better color rendition than any of the wider zooms used. The real shocker was the Monital f/3.8 compact lens with a range of 17-85mm. It is an unbeatable tool when you need quick set-ups on a hand camera for it delivers exciting shots in beautiful color.

A final point on both Monitals and Rank Taylor Hobson primary lenses. I will again mention discipline. At times little thought is given to the size of the finished image when magnified many times over on the projection screen. I generally work within a 17-85mm range. The Monitals in the 17-85mm ratio achieve this objective.

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People who work with 16mm film can no longer be satisfied with less than professional quality. That is exactly what Rank Taylor Hobson Monital lenses deliver, professional quality all the time.



* Winner of 12 "News Pictures of the Year" awards and "Golden Mike" awards. Has filmed over 50 documentaries and shot more than 2 million feet of film for NBC and prominent Sponsors in the last 18 years. Gene is now an independent Producer/Director/Cameraman.

Gene Barnes



All photos by Rick Neff.

For complete information regarding Rank Taylor Hobson lenses contact the RPI office nearest you.



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"...and I really felt helpless

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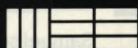
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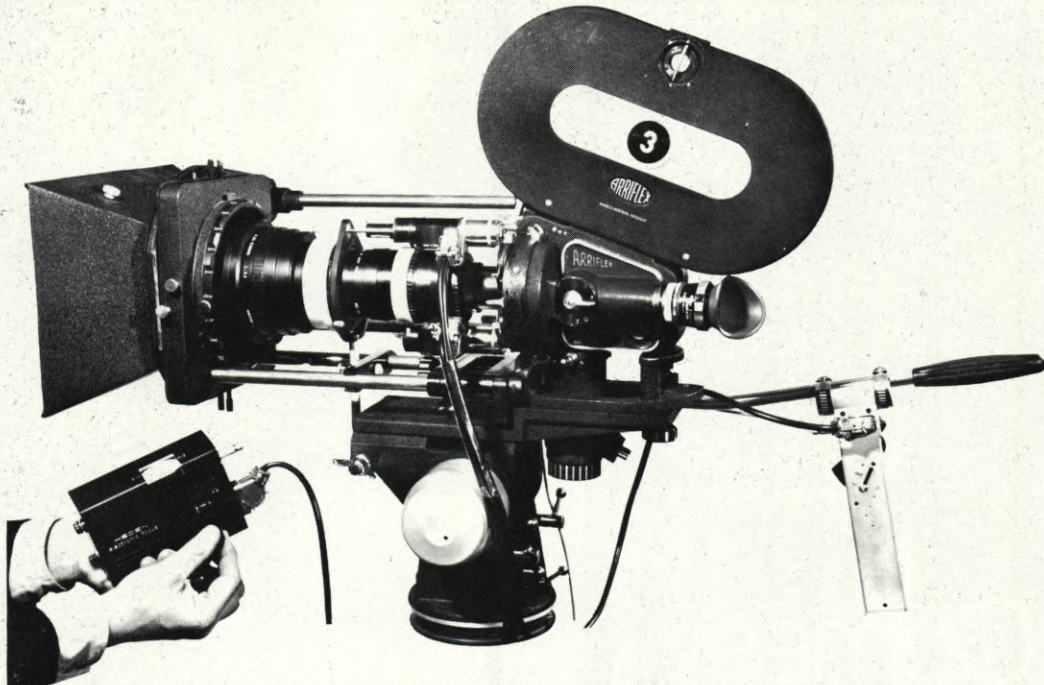
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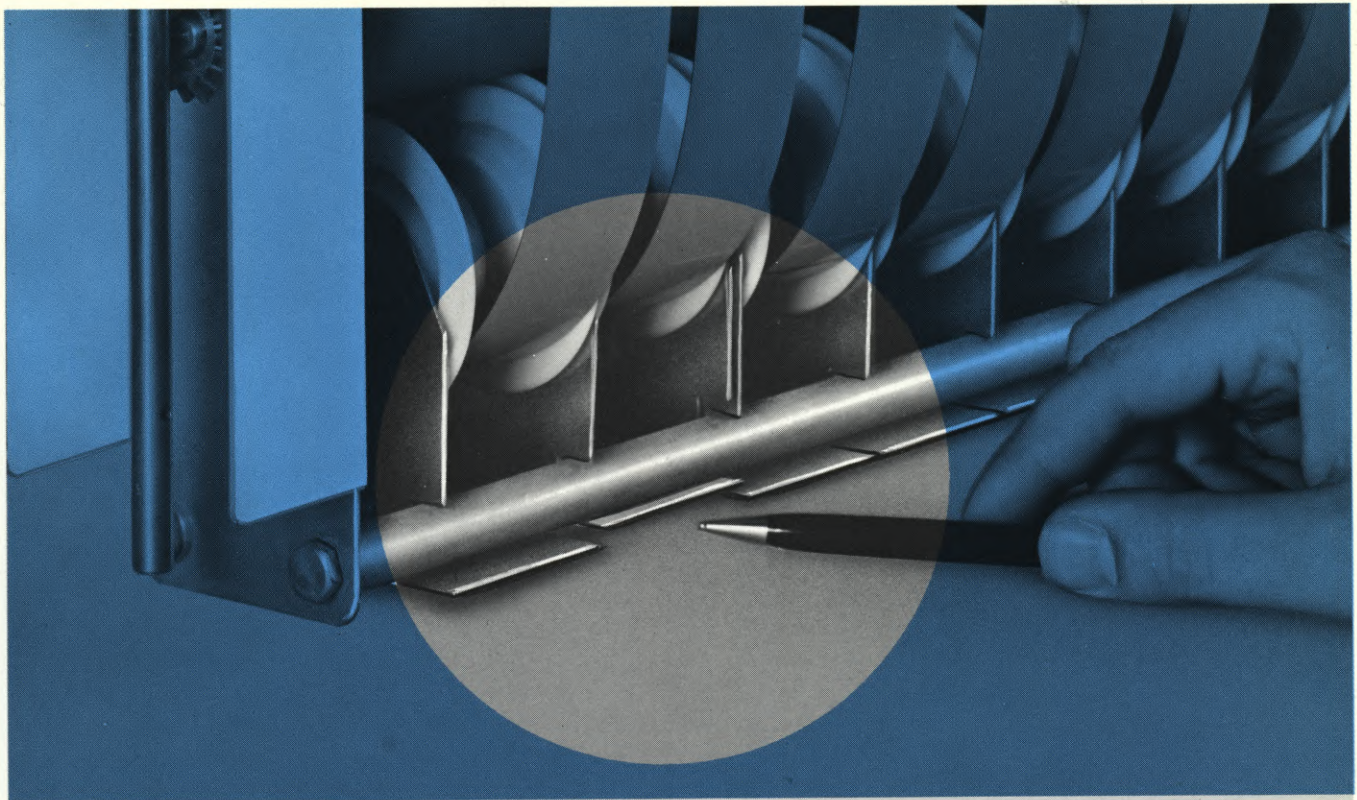
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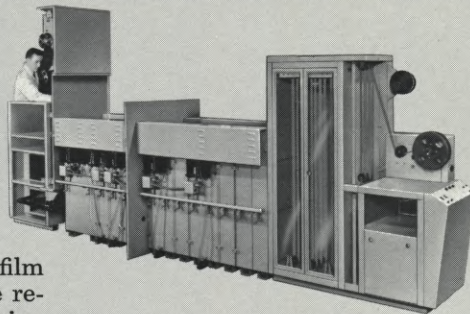


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To depict an event of such vast scale at all on film might be regarded as challenge enough, but to do so with strict faithfulness to historical fact, while, at the same time, maintaining the highest level of technical quality required an enormous degree of faith, the skills of a small army of top cinema craftsmen—and \$25,000,000.

"TORA! TORA! TORA!" was produced by Elmo Williams and directed by Richard Fleischer, with Japanese sequences directed by Toshio Masuda and Kinji Fukasaku. Originally, Japan's great master-director, Akira Kurosawa, had been assigned to direct the Japanese episodes and had become deeply involved in the preparation of the screenplay. Most unfortunately, however, Kurosawa became ill in late December, 1968, and was forced to relinquish his duties after several weeks of shooting. The Japanese production was then re-mounted, re-cast, and resumed filming with the new co-directors, Masuda and Fukasaku.

For several years, there had been great skepticism within both American and Japanese film circles about the making of "TORA! TORA! TORA!" Yet, by summer of 1968, both governments looked favorably on the re-telling of these dramatic events and moments in history. Bitter enemies no longer, but allies in an uncertain world, they agreed that the monumental story of both sides should be told; that it contained lessons for the future.

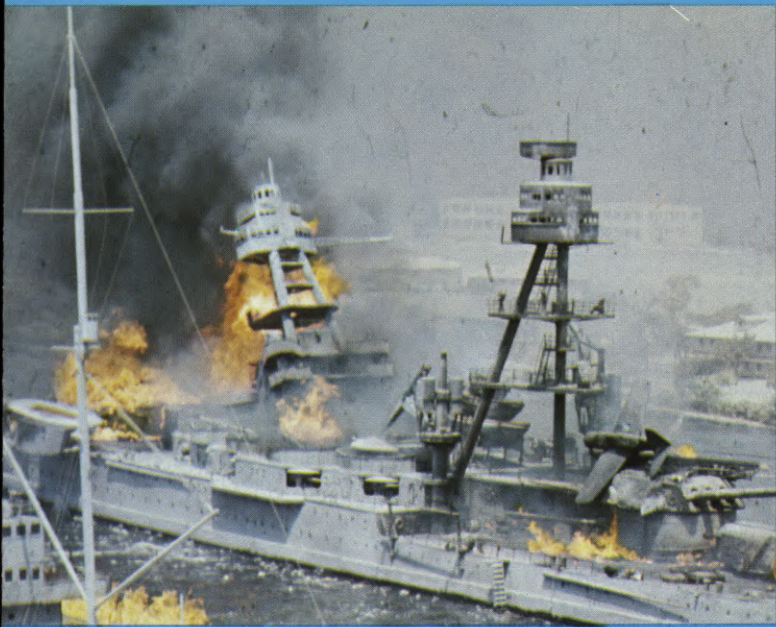
Perhaps Minoru Genda, the Japanese naval strategist who was given the assignment of planning the raid, summed it up best: "I would hope that we have all reached a level of intelligence, and understanding, where nations can treat history as it happened."

So, after months of international negotiation the Japanese motion picture industry joined with the American film industry to launch what was to be a precedent-setting venture, one of the largest ever mounted, and certainly one of the most unusual.

There were two separate films to be made, one by the Japanese production unit, to be filmed in Japan, with Japanese technicians and a Japanese cast; the other, to be filmed by American technicians, with an American cast. Completed, these two films were to be edited into a single three-hour roadshow

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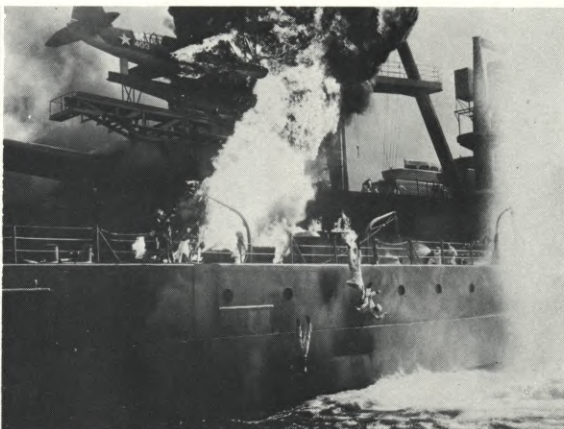
Civilians flee residential areas near Pearl Harbor as the bombs come crashing down. Residents of Oahu were killed and wounded in locations as far away as 10 miles from the focal point of attack. Complete surprise element of the raid early on a Sunday morning caught the population unawares, resulting in numerous casualties.

motion picture.

Again, experienced production personnel on both sides of the Pacific viewed the project skeptically. Simultaneous filming by two separate and distinct companies on one story! Spread by thousands of miles! The great barrier of language! Different production methods! Different equipment!

Yet the known problems were always surpassed by the subject of the film story. The one common denominator was film; the singular effort on both sides was to get the "film into the can." And not unexpectedly, the solution to creative communication between Japan and America in the making of "TORA! TORA! TORA!" turned out to be visuals—six hundred and sixty-one sketches representing scenes to be shot by each side.

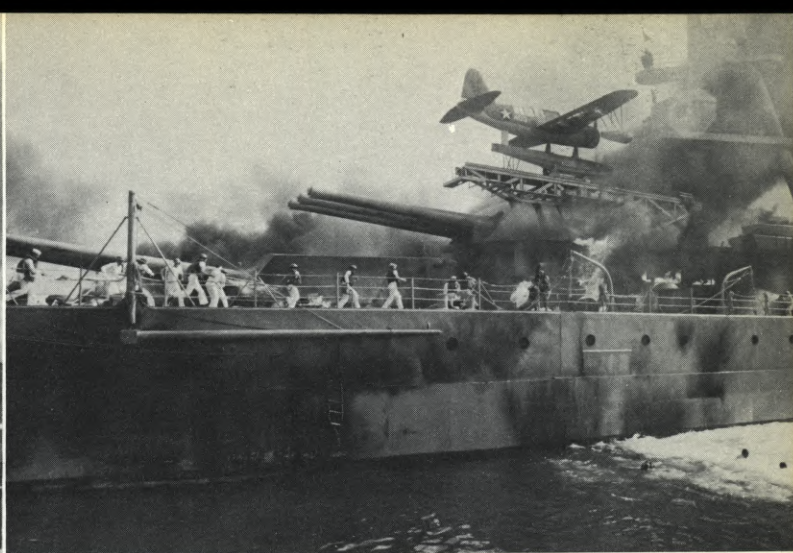
Telex systems between Kyoto, base of the Japanese operation, and Hawaii and then to Hollywood, tied the two



(LEFT) A direct hit is the first telling blow against the ill-fated *USS West Virginia* as crewmen are hurled overboard. (CENTER) A closer view of the *West Virginia*, as additional members of the crew are thrown or jump over the side. (RIGHT) Military personnel duck for cover behind a U.S. Navy plane that is already a tangle of flaming wreckage as a result of low-level raids on the island's airfields.

(LEFT) Japanese pilots belowdecks on a Japanese aircraft carrier steaming toward Pearl Harbor run through a briefing drill on the identification of American battleships. (RIGHT) Japanese aircraft aligned on deck of carrier warm up their engines in the darkness just before dawn in preparation for bombing of Pearl Harbor. These sequences were filmed aboard full-scale model of the aircraft carrier *Akagi*, built on the beach at Ashiya, Fukuoka Prefecture, Japan.





(LEFT) A flight of low-flying Japanese aircraft bombs and strafes American planes neatly clustered in rows along airstrips. (RIGHT) Crewmen aboard a U.S. warship rush to their battle stations, while others attempt to quell the multiple fires set on deck. Special Mechanical Effects expert A.D. Flowers was responsible for the hundreds of realistic explosions that had to be rigged for the live-action sequences.

production units together. A small American liaison group provided the day-by-day information necessary to coordinate activities of the twin efforts. Often, it was "lend-lease" with Japanese costumes airfreighted toward Hawaii or California; Panavision camera equipment jetting toward the Orient. Film shot in Ashiya took domestic air to Osaka, was developed in Kyoto, and soon was aboard JAL or PanAm for the long flight to California; aerials over Pearl Harbor were expressed to Kyoto.

For everyone involved, it was a pathfinder operation, a first in film history, and it proved that the "impossible" was not impossible at all.

The Japanese Production

Under direction of Toshio Masuda and Kinji Fukasaku, the Japanese sequences of "TORA! TORA! TORA!" were filmed at Ashiya, on the island of Kyushu; at Iwanai, on Hokkaido; in Tokyo for exteriors of the Imperial Palace and the United States Embassy. Interiors were filmed at Toei-Kyoto and Shochiku Studios, Kyoto; also in Osaka.

According to Japanese film trade publications, no other film in the history of that nation's industry received "such elaborate and meticulous research." Poring over government records, examining old photos, consulting with the family of the late Admiral Yamamoto, digging out the plans and specifications for the naval aircraft, tracing the marine architect's blueprints for the battleship *Nagato* and carrier *Akagi*, researchers delved into every possible facet of the period to meet official Tokyo demands that the motion picture be authentic.

Cameras rolled on the bright morning of March 3, 1969, at Ashiya Air Force Base, located midway between Fukuoka and Kokura on Kyushu. There, on beach sands, three-quarters of the 35,500 ton Japanese carrier *Akagi*, Ad-

miral Nagumo's flagship for the Pearl Harbor attack, had been constructed full-scale. Parallel and two thousand yards away, the full-sized battleship *Nagato*, flagship of Admiral Isoroku Yamamoto, loomed against low mountains, her prow to the sea.

The original *Akagi*, converted from a battle cruiser hull, was sunk by American naval aircraft during the Battle of Midway in 1942. The 39,000-ton *Nagato* survived World War II, but was sunk at Bikini in 1946 as the result of atomic bomb tests.

Scenes filmed on *Akagi's* deck included pre-dawn preparations for take-off to bomb Pearl Harbor, with her complement of aircraft revved up; her plane handlers screaming "Banzai" over the roar of exhausts. Return of her triumphant pilots after the strike was also recorded by the Panavision cameras.

Nagato became the focal point for massive scenes involving Admiral Yamamoto's change of command ceremony

on relieving Admiral Zengo Yoshida as Commander In Chief of The Imperial Fleet. She saw many other days of filming. On *Nagato's* quarterdeck, Yamamoto argued for his plan to attack and destroy the United States Pacific fleet; on her foredeck, Yamamoto watched his torpedo planes carry out exercises in the summer of 1941; at her rail, staring out to sea, the admiral came to realize what destruction he was soon to unleash.

Nagato, six hundred sixty feet in length, and ten stories high, constructed from the original plans, the largest film set ever built in Japan, figured in seven weeks of filming.

Weather conditions were severe during most of the Kyushu location, and cherry blossoms were a little late in making their appearance. Rain and snow often pelted the huge ship sets and on many days the company was forced inside into the inner hull of *Akagi* where several "cover" sets had been built.

Continued on Page 174

Soldiers manning a machine gun nest are ripped by bullets from low-flying Japanese aircraft that strafed the coastal defenses of Oahu. Planes were expertly flown by young military and civilian jet pilots, most of whom had never flown propeller-driven aircraft in formation prior to taking part in the filming.



MY PARTICULAR TIGER

It took months of dedicated effort, a small army of top-notch technicians and incredible coordination to re-stage and photograph the disaster that took place at Pearl Harbor on a quiet morning in December, 1941

By CHARLES F. WHEELER, ASC

Director of Photography (American Episodes)

Director Richard Fleischer (right) "gives the word" on an upcoming scene to the author, "TORA! TORA! TORA!" Director of Photography (American Episodes) Charles F. Wheeler, ASC.

"TORA! TORA! TORA!" which means, in Japanese, "TIGER! TIGER! TIGER!" was the code signal sent by the command aircraft of Lieutenant Commander Mitsuo Fuchida to the Japanese carrier flagship *Akagi* after complete surprise was achieved in the aerial strike at the United States Naval Base, Pearl Harbor, Hawaii, on December 7th, 1941.

As producer of the film which re-creates this stunning historical event, Elmo Williams likes to refer to the job as being akin to having "a tiger by the tail". Actually, he had a lot of tigers by their tails, and so did the small army of top technicians engaged by 20th Century-Fox for the monumental task of putting the story onto the screen. My particular "tiger" was the assignment of Director of Photography on "TORA!", which included photographing all of the American episodes, plus the climactic attack on Pearl Harbor itself.

As a cinematographer, I had encountered my share of problems while filming in such locations as Panama, Peru, the South Pacific, Spain, Portugal, Canada, Cuba and Puerto Rico—but the vast scope of the subject matter portrayed in this production involved problems such as I had never imagined before and which, indeed, few cinematographers are called upon to cope with during their careers.

What were the problems we faced? Well, I would say the main one was that of coordination. When you consider that this picture was being made about

the attack on Pearl Harbor and you realize that in *one hour* the navy had suffered a greater loss than in *all* of World War I, the magnitude of the planning necessary to recreate this destruction became apparent. The pre-production unit started shooting in Washington, D.C. on December 7th, 1968. By the time our work began in Honolulu a month later, the construction crews had already been busy for a couple of months. We worked mainly on Ford Island, in the middle of Pearl Harbor, but also had major locations at Wheeler Field and Schofield Barracks, Kaneohe, which had been the navy seaplane base in 1941, and Barber's Point. The latter was where all of our planes were stationed and maintained and also where the navy allowed us to blow up an old hangar that was to be destroyed anyway.

We really spent the first two or three weeks on a sort of "shakedown" effort. We were doing second unit shots and checking out the aircraft. After all, we were to use 36 reconditioned World War II airplanes, including five B-17s, a PB4Y, an old SBD, two P-40's and the rest disguised VALS, KATES and Zeros. We needed to find out what you could do with them safely, how many could be in the air at the same time and what limitations the pilots were going to have. There had been one fatal accident before the start of the picture and we wanted to be as sure as possible that there would not be a repeat. The pilots

Continued overleaf

(LEFT) Preparing for a front-projection shot at 20th Century-Fox Studios. P-40 fighter plane is held by an enormous four-armed hydraulic "grabber" which gave the aircraft four axes of rotation, as well as vertical and horizontal movement. (CENTER) Wheeler lines up a shot with the Panavision Reflex camera. (RIGHT) A large pineapple barge with helicopter pad (center foreground) and a 30-foot parallel (background) made possible shooting of process plates simulating point-of-view from ship superstructure, without having to tie up any ships.



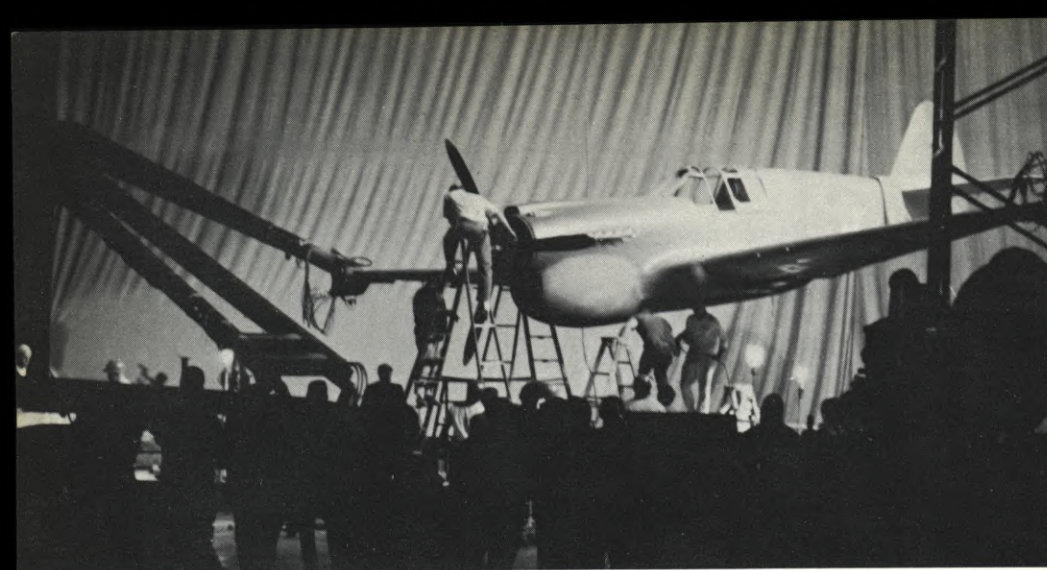
Camera Operator Jack Whitman, Jr., Wheeler, Assistant Cameraman Tom Kerschner and Gaffer Bill Huffman, III on location at Makena Beach, Hawaii.



Wheeler trying to outguess the varying sunlight during a raging fire sequence staged at Ford Island, a constant problem on the Hawaiian location.







A full-sized American fighter plane is hung on wires in front of a highly reflective front-projection screen which, in this photograph, has been temporarily covered by a curtain to protect its surface between set-ups. The blue-screen process was also used in cases where the background plate was not available or its quality was uncertain.

were absolutely tremendous and although there were a few near misses, they flew those old crates in precise, pre-scheduled patterns over and over again and seemingly enjoyed every minute of it. The nearest we came to disaster was when one of the landing wheels jammed on a B-17 as it was attempting to land at Barber's Point. As soon as the call came in on our radio saying that the disabled aircraft had to get down soon, we raced over, set up three cameras, and were ready when it finally skidded to a stop on the hastily greased field. The shots were used in the picture and although there wasn't any accompanying smoke, as there would have been at the time, we felt the realism was adequate enough. So did the pilots.

But, back to the problems of coordination. We were fortunate in having Elmo Williams as our producer. He not only brought with him tremendous experience and enthusiasm for this whole project, but he worked hard to see that everything possible was done to help us achieve our common goals. He also brought Richard Fleischer in as director. I had worked with Dick previously and admire him very much. He is my kind of director. He has the ability to listen to

everyone, discuss the problems thoroughly, but then make up his own mind and stick by his decisions. He really kept the production moving well and this was a gigantic task in itself. We used as many as five cameras on every major shot, each complete with its own crew, and basically our philosophy was that it had better be good the first time because after the set has been blown up it can't be re-shot!

In order to enable the audience to simultaneously view the action as an observer, and also feel that they were actually a part of the hell, we used one camera at long range and set others with long focal length lenses. Additional cameras were used mainly to cover the action from different angles so that the explosions could be used more than once and not be recognizable. Getting around to check out all the cameras was a problem in itself and one which I partially solved with a bicycle, but shooting a production like "TORA! TORA! TORA!" could definitely not be done from a canvas chair. Rehearsals were naturally very limited. We rehearsed what we could and tried to anticipate the rest, and the crews were so great that there were very few mix-ups.

(ABOUT THE AUTHOR: "TORA! TORA! TORA!" (American Episodes) Director of Photography Charles F. Wheeler, ASC, upon graduating from the University of Southern California, began his cinematographic career in the Camera Department of the Walt Disney Studios. He has been behind a camera ever since, including time spent in World War II as a photographic officer on Admiral Nimitz's staff. He returned to the Disney Studios after the war and, following a brief stint as an assistant director, became a free-lance assistant cameraman, working for and learning from such top-rated cinematographers as the late Franz Planer, ASC; Russell Harlan, ASC; Burnett Guffey, ASC; George Clemens, ASC, and Joseph LaShelle, ASC. In 1955 he became an operator and was fortunate enough to work on such memorable films as "INHERIT THE WIND", "JUDGMENT AT NUREMBERG" and "IT'S A MAD, MAD, MAD, MAD, WORLD"—all with Director of Photography Ernest Laszlo, ASC. Seven years ago Wheeler became a first cameraman for Cascade Studios and was able to sharpen his technical skill further while photographing more than 500 commercials for that company. His feature credits since then include: "DUEL AT DIABLO", the prologue of "HAWAII", "CHE", "YOURS, MINE AND OURS" and the currently-in-release "C.C. AND CO.", "PIECES OF DREAMS" and "TORA! TORA! TORA!". Also completed and awaiting release are Norman Lear's "COLD TURKEY" and "BAREFOOT EXECUTIVE", a Walt Disney Production.)

We used all Panavision equipment and it held up very well, was highly adaptable and very dependable. (That sounds like a description of our camera crew too.) Great guys to work with—Operators Jack Whitman, Mike Butler and Arnold Rich and assistants Ron Vargas and Tom Kirshner are as good as they come. The light in Honolulu is incredible due to the clear air and I found that the usual light is a 26 compared to a 21 in Los Angeles. The weather gave us some trouble because more than half of the action of the picture is supposed to take place within the time interval of a single morning. As the weather in Honolulu ranges through about five daily variations, it kept us hopping to try to match the quality of light from scene to scene.

Sometimes it would take a week to rig a single shot. For instance, we had a long shot of Admiral Kimmel walking out of his house and looking toward Pearl Harbor after the attack was in full sway. The effects crew had rigged more than 100 enormous smoke pots all over Pearl which had to be strategically placed in order to cover today's modern installations, as well as to send smoke streams several thousand feet into the air. Once they start, you can't ask for a retake or decide that you don't like the effect. The amount of planning and coordination necessary to film just this one scene was monumental. Among other things, whereas most special effects are set off electrically, the smudge pots had to be started manually.

A.D. Flowers was the Mechanical Effects genius responsible for creating this and the dozens of other spectacular effects necessary to restage the holocaust of Pearl Harbor and he did a magnificent job of it. He plotted out what amounted to a full-scale war and blew up practically everything in sight.

As long as I'm talking about such things as coordination and talented craftsmen, I might say that there were so many highly competent technicians engaged in the filming of this picture that one could write an entire article about them. L.B. "Bill" Abbott and Art Cruickshank, both A.S.C. members, handled the Special Photographic Effects. They supervised the front-projection, blue-backing and miniature shots. They knew exactly what they wanted and we tried very hard to give it to them.

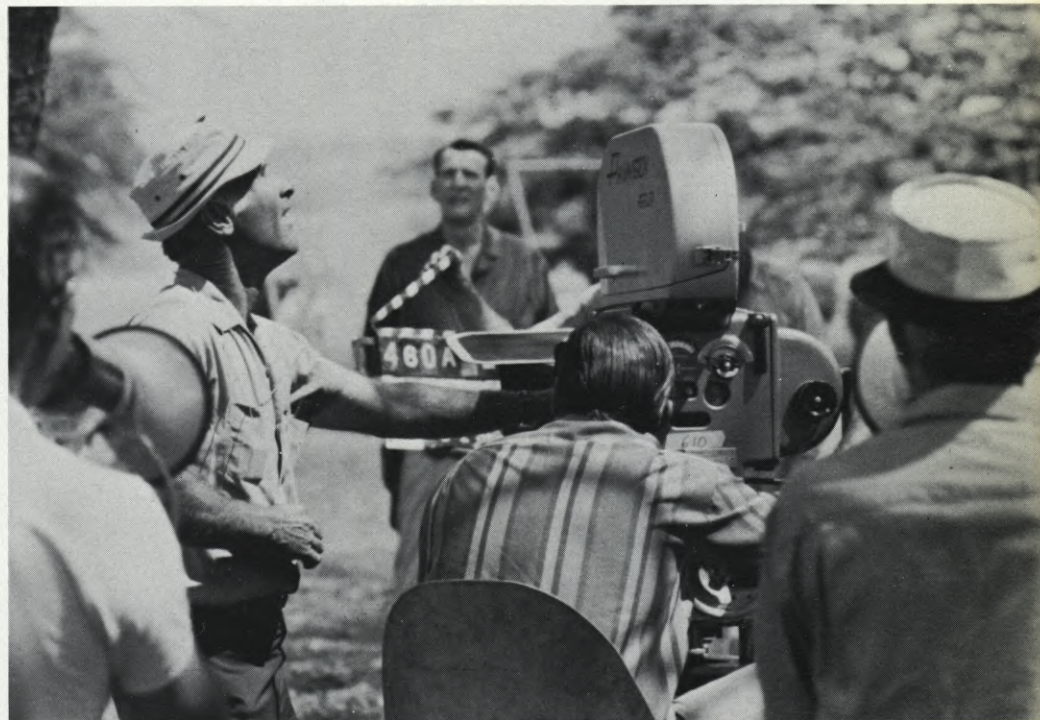
Ray Kellogg did a great job of directing the second unit and Dave Butler got some tremendous footage while photographing nearly all of the aerial shots with the help of pilot Dave Jones who flew him around.



(LEFT) Pun intended! Cinematographer Chuck Wheeler stands next to a sign warning litterbugs against doing their thing at Wheeler Field in Hawaii. (RIGHT) Wheeler describes to his crew the requirements for an upcoming camera set-up. He observes that rarely have so many top-notch technicians been engaged in the production of a single feature motion picture.

In reference to the problem of co-ordination again, I really appreciated the hard work of Comdr. E. P. Stafford, the Naval Coordinator, who was also our liaison between the Department of Defense and the company. Being a Commander in the Naval Reserve myself I could fully appreciate the snafus and numerous technical problems involved in first securing permission for us to use locations and equipment, and then going through another complete procedure to arrange for availability of same. The navy gave us two survey destroyers, incidentally, which were to be scrapped. They were very helpful as background and one of them was positioned in various places to block the Arizona Memorial. Ed also provided three hangars on Ford Island which we kept filled with our fleet of over 60 pre-war automobiles, trucks and military vehicles, all of which had to be re-built and made operative. We did have to build and operate our own small boat landing dock and every morning we boarded our own small service craft for the trip to Ford Island and our sets. These were

Continued on Page 167



A scene is slated for the Panavision camera. As many as five cameras were used simultaneously for every major shot, each complete with its own crew. Getting around to check all of the cameras was a problem which Wheeler partially solved by means of a bicycle.

(LEFT) Crewmen aboard American battleship ready machinegun in defense against oncoming wave of Zero fighter planes. (CENTER) Bombing and strafing at low altitudes, Japanese aircraft make a shambles of Wheeler Field. (RIGHT) Clouds of black smoke billow forth from the innards of U.S. warship which has taken direct hit by enemy bomb. Filmed attack was so realistic that it brought shudders to Hawaii residents who were on Oahu when the actual Pearl Harbor devastation took place.



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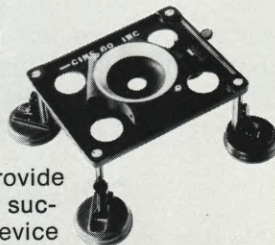
Instant Camera Pod

Our single universal shoulder pod ("unipod") is a lightweight shoulder mount that accepts all cameras. Easily removable between takes, it keeps the camera in the ideal shooting position while offering the maneuverability of single-shoulder construction. Used with the Uni-Eclair Mount (detailed later), this is the only practical pod for the Eclair NPR-16. (By the way, we also have an excellent double-shoulder pod as well.)



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If you've ever watched a good shot pass you by while trying to thread a camera onto a tripod or shoulder pod, the Cine 60 Snaplok is your answer. Combining rapid, fail-safe operation with the ruggedness and precision alignment needed for day-in, day-out use, the Snaplok features light weight and high rigidity. One section mounts on the camera; the other on tripod or shoulder pod. A single pushbutton instantly separates the two. The base unit of the Snaplok is compatible with standard 1/4" and 3/8" sockets.



Instant NPR

Our Uni-Eclair Mount is just what the name implies—a universal mount for the Eclair NPR camera. Rugged, yet surprisingly light, it may be left on the camera at all times, ready for hand-held operation or shooting with a tripod or shoulder pod. And, it makes a handy camera rest between takes.



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What the handgrips can do will give you some idea of what the camera can do.

The idea behind the Bolex 16 Pro was to give the professional a 16mm sound camera that would satisfy him in every way. We started with a clean sheet of paper and a list of the things we felt a professional camera should be able to do. By the time we finished, we had a 16mm camera like no other. Everything about it was different—starting with the handgrips.



EVERYTHING AT YOUR FINGERTIPS.

The handgrips of the Bolex 16 Pro aren't for holding the camera. They're for operating the camera. When you wrap your hands around the grips, your fingers rest on sensitive rocker switches that control the power zoom and power focus (which can also be operated manually). You control the rate of zoom and focus through a built-in rheostat.

The handgrips also house the running speed selector and the fade-in fade-out control.

Extension sockets in the ends of the handgrips let you operate the camera remotely, from as far as twenty feet.

And if you should drop the camera on its handgrips, while on location in Timbuktoo, the grip can be replaced. Because the camera and its power source are modular.

BODY HELD. NOT HAND HELD.

We wanted a camera that would work equally well on or off the tripod. In the studio or on location. So we designed ours to rest comfortably on the shoulder. By using a monopod attachment, the camera becomes entirely body held, leaving your hands free to guide and operate it.

WE BUILT A BETTER MAGAZINE.

We placed our 400' co-axial magazine to the rear, making the camera easy to work with in tight spots, like inside a car. We've minimized loading and handling. The film threads itself automatically, from core to core, in three seconds. Then a signal light tells you the camera is ready for shooting. (This same light also indicates when the film is exhausted.) A built-in cutter makes it easy to remove partially exposed film.

ELECTRONICALLY DRIVEN MOTOR.

The Bolex 16 Pro has a built-in four-in-one electronically controlled motor that runs at variable speeds of 16 to 50 fps, forward and reverse. (There's also a model with speeds of 16 to 100 fps.) It can also shoot single frames for animation and time lapse studies. The motor operates so quietly that it produces only 32 db's five feet from the lens. So no blimp is needed. And because the motor starts and stops instantly, at all speeds, there are no blank frames between scenes.



The motor drive is crystal controlled, providing an accuracy of plus or minus one frame in 1,000' of film. The camera permits synch sound shooting without direct connection to a tape recorder.

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Presently we have three interchangeable lenses for the Bolex 16 Pro. An Angenieux f/2.2 12 to 120mm zoom. A fast Schneider f/2.0 10 to 100mm zoom. And an extreme wide angle Zeiss Distagon f/2.8 8mm lens. An additional 20 to 1 Angenieux 12 to 240mm zoom will be available shortly. And it's possible to adapt some of your own lenses for use on the Bolex 16 Pro.

EXPOSURE CONTROL. AUTOMATIC AND NOT.

It's there, even if you choose not to use it. The Bolex 16 Pro has a through-the-lens light metering system and automatic exposure control, for film speeds of 12 to 1600 ASA. The meter is coupled to the camera speed control, and adjusts itself automatically to correspond to any changes you make in the running speed. A manual override control is built right into the handgrip, so you can take over any time you please, without so much as moving your hand.

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The Bolex 16 Pro is a mirror reflex camera with a 20 X magnification at the viewfinder. The mirror is always in viewing position when the camera stops. The viewfinder converts instantly from ground glass to clear glass, to give a brighter image in dim light or with the lens stopped down. You can rotate the viewfinder 45, 90 and 180 degrees, which makes it possible to film with the camera aiming backwards over your shoulder.

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CREATING THE SPECIAL EFFECTS FOR

TORA! TORA! TORA!

A top expert in the field of motion picture "magic" explains how the epic sweep of "TORA!" was augmented through the use of miniatures and front-projection

By L.B. ABBOTT, ASC

Special Photographic Effects

In order to re-create the historical events depicted in "TORA! TORA! TORA!" it was necessary to show the Japanese fleet steaming through a violent storm as it approached Oahu and the American fleet in the process of being destroyed at Pearl Harbor.

To depict these scenes, the 20th Century-Fox Miniature Department, un-

der the guidance of Ivan Martin and Gael Brown, built models of 19 Japanese ships and 10 American ships, plus the Battle Ship Row docks at Pearl Harbor and the surrounding land areas. The total cost of building and photographing these miniatures came to \$1,250,000. Unfortunately, due to the necessity of holding the picture to a manageable running time, a good many of these spectacular scenes had to be deleted from the final cut.

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The Japanese models were built on a scale of 1/2-inch to the foot, and the American ships 3/4-inch to the foot. The determining factor in selecting a larger scale for the American ships was the fact that they had to be blown up, and the explosions could be made to look more believable if done on a larger scale. Built according to these scales, the average length of the miniatures was 40 feet.

The models were photographed at the 20th Century-Fox ranch in the Sersen tank (originally built for the filming of "CLEOPATRA") which measures 360 feet square, has a backing 75 feet high and is unique in several respects.

The bugbear with most such tanks is that they have square sides, including the weir, and when you agitate the water the waves hit the sides and "echo" back into the tank. In a very short period of time, instead of having a directional flow, you have wave patterns that are going straight up and down. When I was in England preparing for "CLEOPATRA" I discovered that the British amphibious naval forces had built a wind-tunnel type of tank to use in testing out their models. They had run into the echo problem immediately, but some brilliant young fellow had decided he could cure it by arranging baffles similar to venetian blinds along the sides and angling them downward about 20 degrees from the edges, so that as the waves came across these baffles, their force would be diminished. Then, again, when they hit the sides and came back, their force would be further reduced, so that the echo was essentially cancelled all the way.

When we built this new tank at the Fox ranch we incorporated that idea into it, with the sides beveled at about a 30-degree angle. Now, when we start a wave across the tank, it doesn't have anything to hit and echo off of. If it gets to be a big wave, it will go on over the side and drain back through the drainage system. It has worked excellently.

In a tank of this modern type, you have quite a bit of leeway in controlling the size of the wave pattern in relation to the scale of the miniatures. To make the water surface of the tank appear to be open ocean you really need *two* separate wave patterns. One of these represents what would be a ground swell and is made with large slow-moving agitators. The pattern is kept intermittent in order not to produce a series of identical swells. For example, we might roll the agitator two times and pause for a beat, roll it once and pause for another beat, and then roll it three more times, etc.

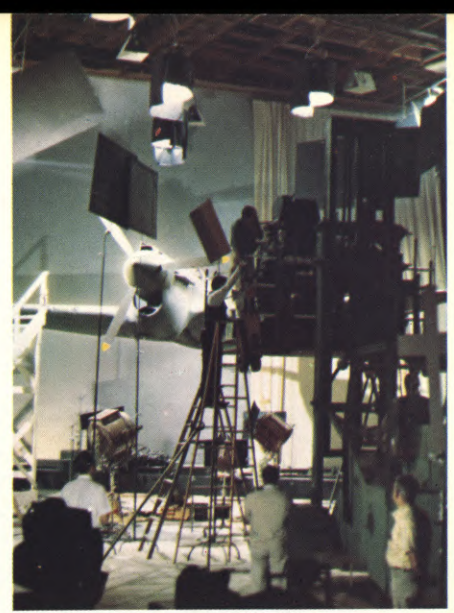
Once you have this underlying pattern going, you then augment it with fans directed onto the surface. The speed and size of the fans will regulate the size of the surface wave pattern. In our case, we supplemented this with hand agitators. A man simply stands in

Continued overleaf





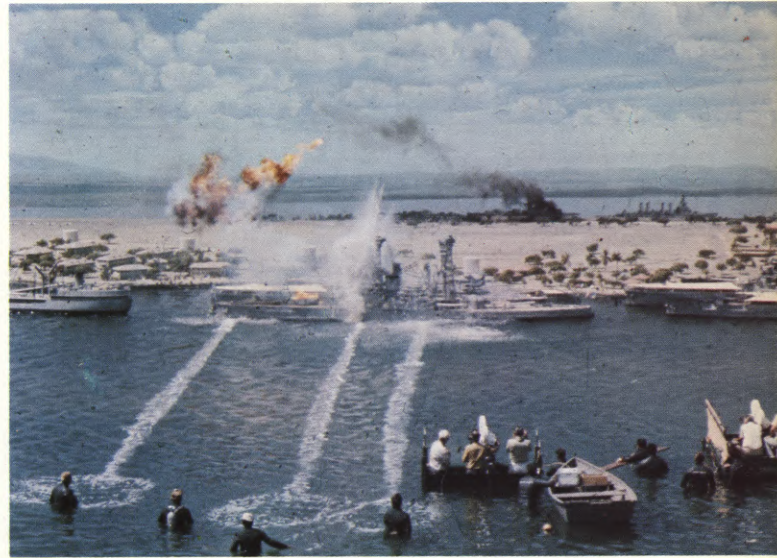
Camera crews, wind machines and teams of Special Effects experts are positioned about the perimeter of the huge tank at the 20th Century-Fox ranch for filming of miniature sequences showing the American Fleet under attack at Pearl Harbor. Ship models averaged 40 feet in length.



On the sound stage, a P-40 fighter plane, supported by a complicated rotational device is made ready for filming of a front-projection scene.



(LEFT) "TORA! TORA! TORA!" Producer Elmo Williams, who has since been elevated to the position of 20th Century-Fox production chief. In the background the Pearl Harbor holocaust rages in miniature. (RIGHT) Two camera crews film the torpedoing of American ships in a miniature reconstruction of Pearl Harbor that is authentic down to the most minute detail. Sky and cloud background was 75 feet high. Torpedoes, propelled by air jets, were guided along underwater cables toward their targets. Water explosions resulting from the hits had to be timed most precisely.



(LEFT) Clouds of smoke billow into the sky as the Pearl Harbor attack, re-staged in miniature, reaches its climactic phase. (RIGHT) The mast of the *USS Arizona* lists at an acute angle as the result of a direct hit. An ingenious "mousetrap" trigger arrangement permitted the mast to be reset for repeat takes and changes of camera angle. Building and photography of miniatures cost \$1,250,000. Filming of the sequences required 40 days.





A fleet of miniature Japanese warships assembles in a harbor of the Kurile Islands prior to setting out for the attack on Pearl Harbor. These miniatures were built to a scale of 1/2-inch to the foot. Models of the American fleet were built to a larger scale (3/4-inch to the foot) because the many explosions involved could be staged more believably on a larger scale.

the tank with a 20-foot 2 x 12 board which he wiggles in a random manner. This creates a broken-up series of small waves on top of the underlying ground swell—and when it's done right, it produces a pretty good "sea".

When "white water" is needed, as it was in the storm sequences of "TORA! TORA! TORA!", it is beneficial to add detergent to the water, but this must be done judiciously. If you overload the tank with it, the detergent is hard to get rid of—and you can end up with bubbles instead of spray.

In designing this type of tank, it's very important to be able to drain and refill it quickly, in order to permit rigging various mechanical set-ups. Therefore, it's well to install huge pumps and an ample drainage system, with the tank supported by a nearby reservoir, so that you can store and reuse your water as often as you wish.

Also, it's desirable to keep the water as shallow as possible, so that men in waders or wet-suits (which are now more common) can get to the miniatures and fix what needs to be fixed without having to swim. The ideal depth

From a camera platform floating in 20th's 360-foot-square tank, the author directs filming of intricate miniature scenes for "TORA! TORA! TORA!".



used to be considered 36 inches, because that allowed the men to work in waders, but the bottom of the tank often became a problem, especially when cables were used to propel the miniatures. It became necessary to add some opacity to the water through the use of a harmless blue vegetable dye. This doesn't really affect the surface color of the water, because that is dependent upon whatever the water is reflecting.

Success in being able to create a realistic sea pattern depends largely upon the ability to place your auxiliary fans precisely and to shift them to work with the natural wind that may be blowing. For that reason we always try to mount them on floats, or at least moveable platforms. I have always had sufficient fans available so that, if the wind switched direction 180 degrees, I could abandon the fans on one side of the tank and pick up with those on the other side. This saved a great deal of moving time and turned out to be very economical in the long run.

To create the sequences in "TORA!", where the Japanese fleet is seen battling a violent storm on its way to Pearl Harbor, we used just about every fan we could get our hands on. These included six huge aircraft fans (five from MGM and one from 20th), four more truck-mounted fans that were almost as large, and about 15 conventional fans from the studio strategically placed about the tank. We would get the fans positioned very carefully and then discover that, for some reason or other, there was a "flat" spot on the water. This would necessitate moving a fan to cover that particular area—but the annoying part was that the area kept

changing, depending upon what the wind was doing normally.

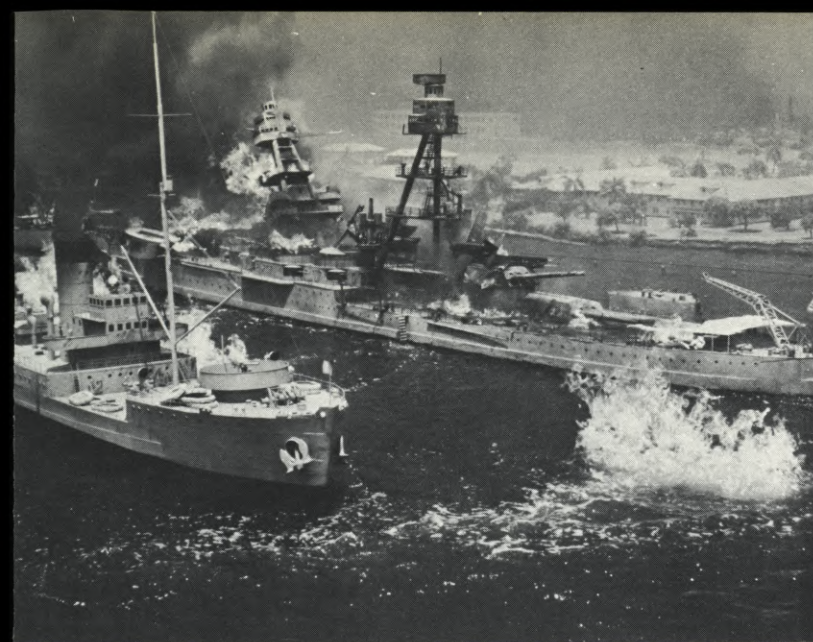
To produce fog for the storm sequences, we fed a mixture of black and white smoke through the fans, experimenting until the correct degree of density was achieved. We also used the fog machines that are common in the industry and which produce quite a volume of white smoke that is rather light and floats better than powder-type smokes. You mix all of these together and then take a smoke pot or fog gun and squirt it intermittently through a fan placed just out of camera range. The effect, when the scene is filmed at a high rate of speed, is that of swirling fog banks that not only diffuse the whole scene with an overall mist effect, but also give it an odd sort of depth.

To produce the giant waves that come crashing over the bows of the Japanese ships during the storm sequence, we used a dump tank which has a hopper that dumps a large volume of water into a sluice, the angle of which can be varied. The flatter the angle, the shallower the wave will be. You have to experiment with the angle of the sluice to get the proper height for the type of wave you want and the maximum carry.

L.B. Abbott, ASC, accepts 1967 Academy "Oscar" from Natalie Wood for Special Visual Effects on "DOCTOR DOLITTLE". He has also been awarded an "EMMY" for his work on "THE TIME TUNNEL" TV series.



The dump tank is placed just off the side-line and you arrange to bring the miniature as close to it as possible. Then you dump the water to get a wave that will go up over the bow. In our case the bow of the average ship model was about four feet above the water line. The duration of the "wave" thus created, when measured in real time, is a very short span—let's say, two seconds at the most. But when you're cranking the camera at six times normal speed,



Miniature scenes from the spectacular attack on Pearl Harbor sequence. (LEFT) The mast of the *Arizona* lists at a 40-degree angle, as the doomed ship takes a direct hit. A near-miss in foreground creates a water explosion. (RIGHT) The deck of the *Arizona* becomes a raging inferno as additional explosions rake its decks. A special Photo-Sonics high-speed camera was used for filming these scenes at up to 15 times the normal frame-rate in order to amplify the size and power of the explosions.

you end up with a 12-second wall of water that climbs up over the bow of the ship.

Regarding the matter of over-cranking in the filming of miniatures, there is a rule of thumb formula that links the frame-per-second rate to the square root of the scale of the models you are using. For example, a model built to a scale of 3/4-inch to the foot is actually 1/16th of normal size, so you would crank your camera at four times the normal speed. This formula is pretty reliable—except for such things as explosions which happen so fast that you don't really see the various stages of the explosion. We had decided that because of the importance of the explosions in this particular film we would explore the possibility of shooting at much higher speeds than are normal for miniature filming.

We bought from Photo-Sonics, Inc. a special high-speed camera which could crank as fast as 15 times normal speed. We used that camera for shooting all of the miniature work, not always at its maximum speed, but generally at a

higher frame-rate than we would ordinarily use—anywhere from 5 to 15 times normal speed. We found that when filming explosions at 15 times normal, as we did for the blowing up of the *Arizona*, instead of getting just one flash, you get the original flash followed by at least one or two more internal explosions within the primary flash. The super-fast frame-rate amplifies the size and power of a small, fast explosion to the point where you feel, almost, that it is getting into the atomic bomb category.

The ship models were constructed by building plaster casts of the hulls. The hulls of both the American and Japanese ships turned out to be remarkably similar, which meant that only a relatively few casts had to be made. These casts were used to pour fireproof, fiberglass molds of the hulls. The superstructures were built separately in order to give each ship its distinctive appearance. In actual photography of the Battleship Row holocaust, the fireproof characteristic really paid off. We were able to

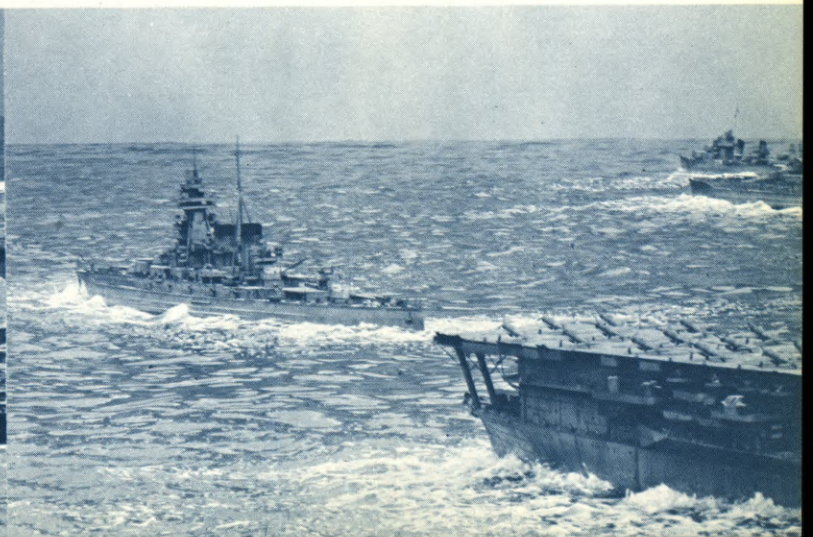
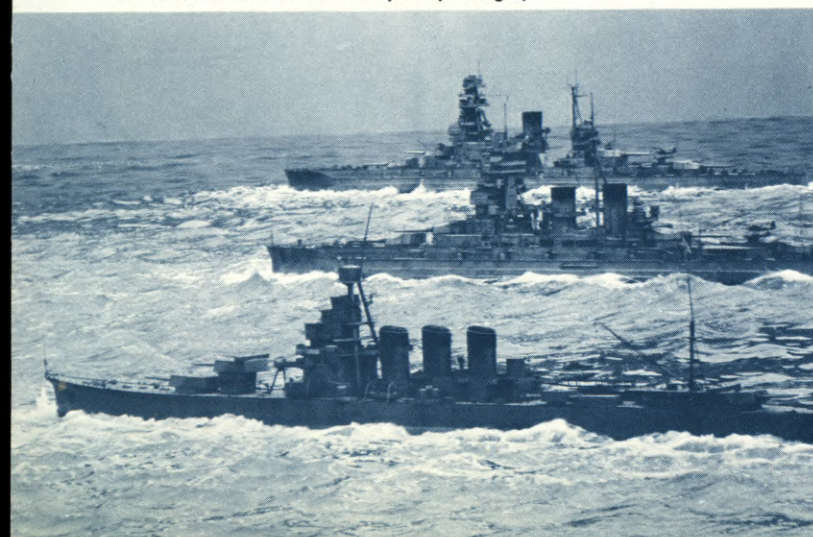
blow up the ships, then reset the moveable superstructure parts and replace the destroyed ones, repaint and reshoot with a minimal time loss.

An ingenious rig was used to lend the greatest possible realism to the sequence in which the *Arizona* is shown being destroyed. When the *Arizona* blew, the mast canted over to an angle of about 40 degrees. This fact is so well known to the public that it was important to show it happening just that way in the picture. The mast was built and mounted on an axis within the hull. There was a trip system that could release a hook electrically and a spring that would give momentum to the mast and cause it to cant in the right direction. We would blow up the *Arizona* and if we needed another angle or decided we didn't like the explosion, all we had to do was reset this "mousetrap" arrangement and we were ready to go again.

We had the model of the *Oklahoma* mounted on a rig that could turn it over a full 180 degrees. Of course, since the

Continued on Page 168

(LEFT) An armada of Japanese warships steams across the 20th-Fox tank, churning up wakes of "white water", produced by adding detergent to the water in the tank. (RIGHT) Japanese miniature warships shown embarking for the attack on Pearl Harbor. Tiny planes on flight deck of carrier in foreground indicate enormous amount of care involved in simulating intricate detail on a small scale. Models averaged 40 feet in length, required six months to build and 40 days to photograph.



TORA! TORA! TORA!



THE FILMING OF THE JAPANESE EPISODES

In Japan, a "co-production" effort unique in motion picture history was launched to tell the other side of the story

By KAZUO KAWAGUCHI, M.B.K.S.

It was March 3rd, 1969, when shooting of the Japanese Episodes for "TORA! TORA! TORA!" actually got underway in Ashiya, Fukuoka Prefecture, Japan. This area had been used as an air base by the U.S. Air Force during the Korean War and, in 1963, as a major location for the Harold Hecht-Daiei production, "FLIGHT FROM ASHIYA", which was directed by Michael Anderson and starred Richard Widmark, Yul Brynner and George Chakiris.

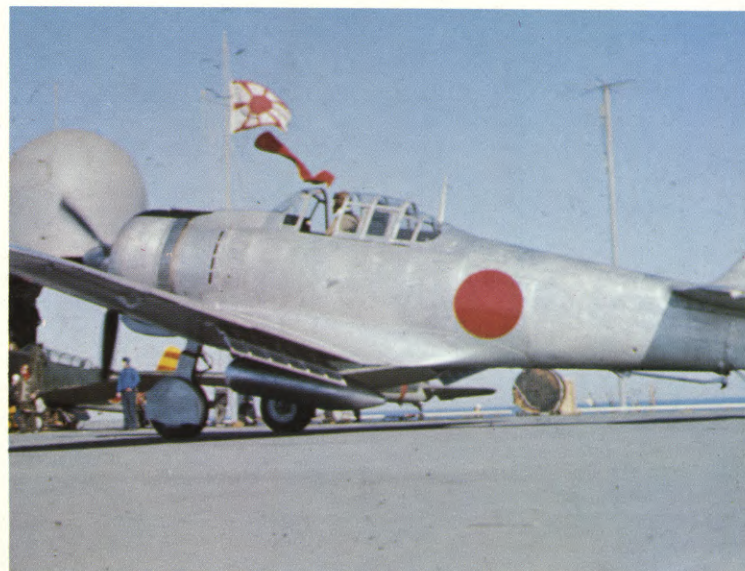
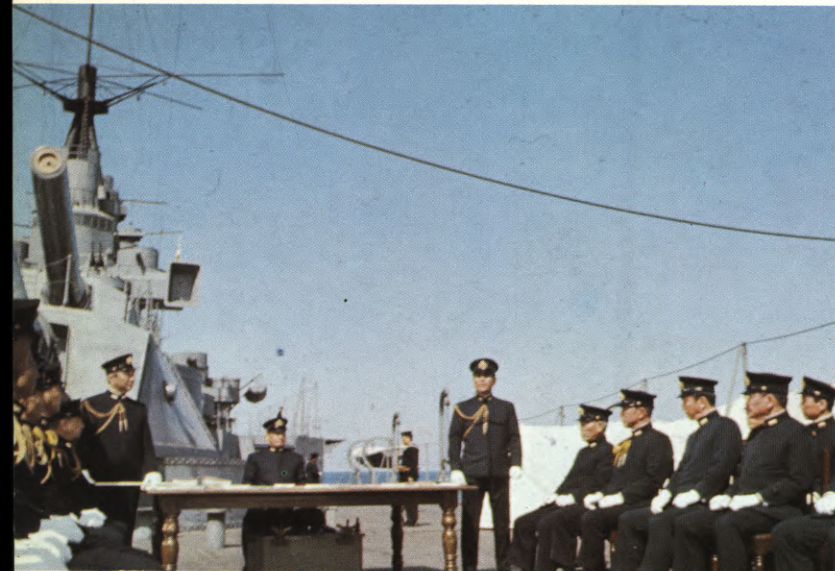
Now, on the sands of the beach at Ashiya, there had been built for the filming of "TORA! TORA! TORA!" two huge outdoor sets, one of which was a full-scale replica of the Japanese Imperial Navy battleship *Nagato*—and the other, a front-half section of the aircraft carrier *Akagi*, also constructed to actual-size proportions. These intricate replicas had required more than six months to build.

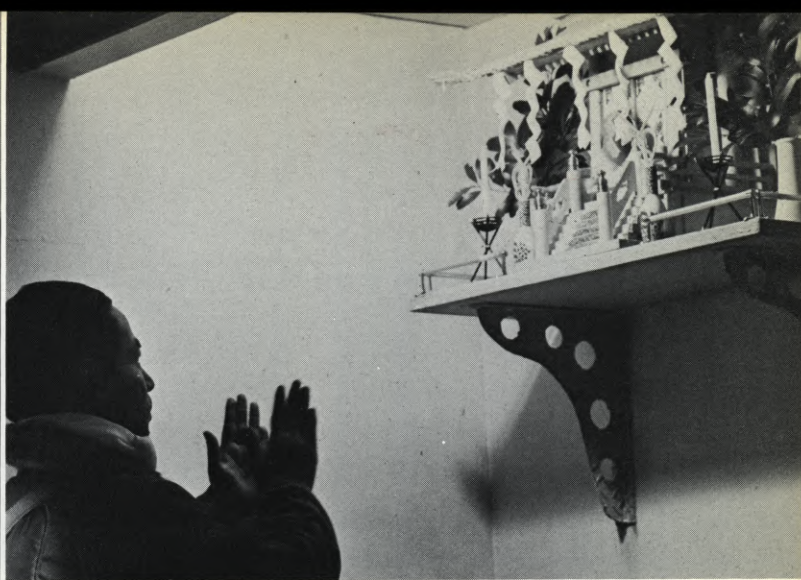
Before shooting began on that first



Famed cinematographer Shinsaku Himeda served as Director of Photography for the Japanese Episodes of "TORA! TORA! TORA!", filmed in Japan with Japanese actors and crew.

(LEFT) On deck of full-scale reproduction of the Japanese battleship *Nagato*, sequence is staged depicting Admiral Yamamoto relieving Admiral Zengo Yoshida as Commander In Chief of the Imperial Fleet. (RIGHT) Since there were no longer any 1941-vintage Japanese fighter planes in existence, AT-6 and BT-13 air-frames were modified to resemble the required aircraft. Modifications were made by Steward-Davis, Inc. and Cal-Volair in America, and by C. Itoh Company in Japan.





(LEFT) With intelligence information on the locations and size of the U.S. Fleet, top echelon Japanese Naval officers plan a surprise attack against Pearl Harbor. Interior sequences such as this were filmed at the Toei Studio in Kyoto. (RIGHT) On a "cover" set inside hull of the reconstructed aircraft carrier *Akagi*, actor playing a Japanese pilot prays before authentic replica of Shinto shrine, just as actual pilots did in the pre-dawn hours of December 7th, 1941.

day, the entire staff gathered on the deck of the *Akagi* to hear speeches by Producer Elmo Williams and Associate Producer Otto Lang, respectively.

Following this ceremony, Director of Photography Shinsaku Himeda, 2nd Unit Cameraman Osamu Furuya, and three additional cameramen (Kenji Ogiwara, Izumi Ogiwara and Muneo Ueda) began to roll their cameras on the sequence which depicts Admiral Yamamoto on board the battleship, watching Japanese pilots practicing low-level torpedo-plane attacks.

The 20th Century-Fox Corporation had brought to Japan eight cameras for the photography of the episodes to be filmed there. This equipment included two Mitchell BNC's, two Mitchell NC's, a Mitchell Standard, a Mitchell Mark II, two 35mm Arriflexes, plus comple-

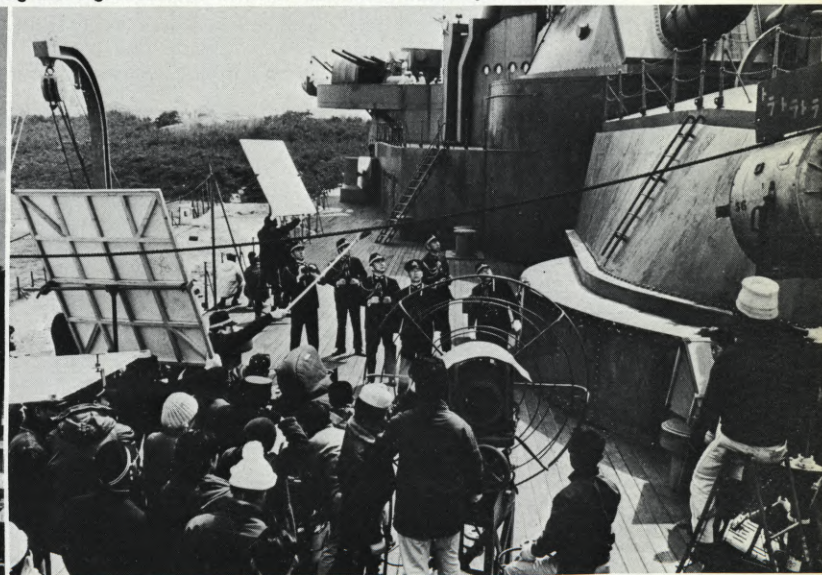
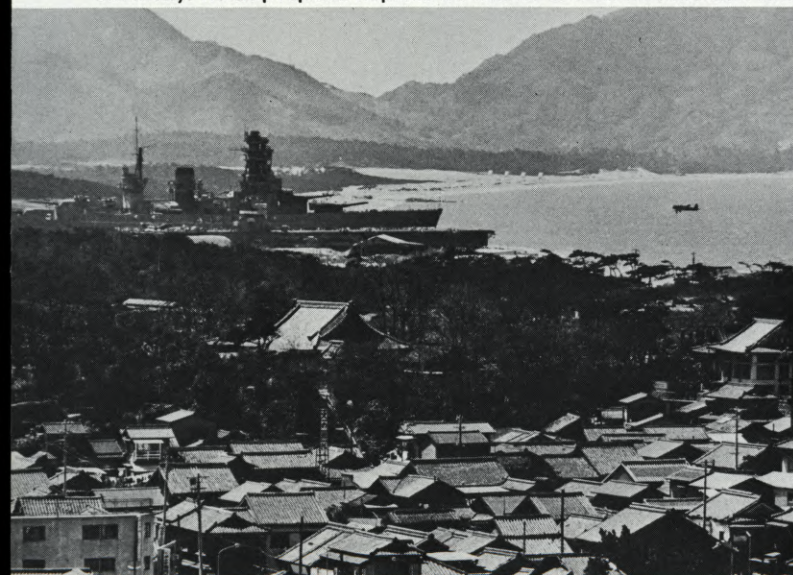
ments of Panavision lenses that included three 75mm, three 100mm, two 150mm, one 600mm, one 800mm, one 1000mm, two 50mm-to-500mm Panavision zoom lenses, one 50mm-to-95mm Panafocal lens and a 80mm-to-250mm Panafocal lens. Among the many other items of equipment brought to Japan, there was also a projector to be used for the filming of front-projection scenes.

After filming with the main unit had begun, cinematographer Osamu Furuya and the second unit were sent to Hokkaido, Japan's northernmost island, in order to photograph a sequence in which inhabitants of a fishing village are shown seeing off the Imperial Combined Fleet as they sailed from Hittokappu Bay in the Kurile Islands to attack Hawaii.

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(LEFT) On the beachfront at Ashiya stand two huge exterior sets built for "TORA! TORA! TORA!"—a full-scale replica of the Japanese battleship *Nagato* (rear), and 2,000 yards in front of it, a three-quarter section of the aircraft carrier *Akagi*. (RIGHT) Japanese camera crew shooting a sequence aboard the *Nagato*. (ABOVE RIGHT) Sailors in dress uniform line the decks of the battleship during formal change-of-command ceremony. Warship replicas required six months to construct and rank among the largest exterior sets ever built for a motion picture.



AERIAL AND STUNT PHOTOGRAPHY FOR

TORA! TORA! TORA!



Intrepid cameraman gets his share of excitement by filming dogfights and explosions, being strapped to the side of a destroyer with flames leaping around him and having a wounded B-17 bounce over his head

By MICHAEL BUTLER

Second Unit Camera Operator

An item in the credits of "TORA! TORA! TORA!" reads: "Aerial Photography by Vision Photography, Inc."

At the time that Vision Photography was formed (which was just after we received the "TORA!" assignment), the company consisted of my brother, David, and myself. Since then it has been broadened to include our other brother, Tony, plus a very talented

group of additional film-makers whom we've worked with.

How the assignment came about was rather interesting. Since there were to be several sequences in the picture that entailed aerial photography, the Producer, Elmo Williams, had researched several types of mounts, finally narrowing his selection to a choice between the Canadian sphere-type mount and Nelson

Tyler's vibrationless helicopter mount. He decided upon the Tyler mount and, after apparently inquiring to find out which cameramen were most experienced at using that mount, he contacted us.

David had started working with Nelson Tyler back when Tyler was building his first mount in his garage, and that's how he got his break into aerial photography. I had been shooting commercials and working as a stunt cameraman. Being brothers, we tried to work together as much as possible, and we had been flying for about three years, working on various pictures. David had just completed a stint on John Frankenheimer's "THE GYPSY MOTHS". Elmo Williams viewed it, and I guess he liked the aerial work that had been done in photographing the skydivers. At any rate, David and I were contracted to go to Hawaii to shoot the second unit footage, which was to include all of the aerials and stunt photography. Ray Kellogg was the second unit Director, David was Director of Photography, and I was his Operator.

The first project we were given after arriving was that of shooting all of the aerial background plates. This turned out to be a great challenge, considering

The Butler brothers and other film technicians now affiliated with their Vision Photography, Inc. "repertory" production group. (Left to right) Tony Butler, David Butler, Don Knight (Gaffer), Michael Butler (author of accompanying article), Chuck Record (Key Grip) and John Fleckenstein (Assistant Cameraman). The group has completed work on two independent features and is preparing a third.



the logistics of 42 aircraft and the necessity for maintaining exact positions.

The biggest problem was that of trying to maintain sufficient air speed in the helicopter to keep up with the fighter planes. They couldn't function at speeds under 100 miles per hour—and with the camera mounted in a helicopter, even a jet Ranger, our maximum speed was about 98. This meant that we had to push the Helicopter beyond maximum speed all the time, just to stay ahead of the aircraft. The stress was so great that we sheered off six rotor pins in the process and the helicopter was totally destroyed. After the picture was over it had to be junked, because the engine had simply disintegrated.

This problem of keeping up with the fighter aircraft and maintaining precise positioning for photography was complicated by the fact that out of the more than 40 Naval and Air Force Reserve pilots engaged to fly the planes, only a few of them had ever flown prop planes in formation. They were used to jets, and it's much easier to fly a tight formation in a jet aircraft than in a prop job because you don't have the turbulence problem.

Most of the pilots had a tough time making the changeover, and they had no knowledge at all of the camera or its special problems. They had planes bouncing all over the place and, at the same time, they were expected to line things up for the camera instead of just flying as they normally would. It was difficult for us, too, trying to talk to 40 guys at once and explain why they had to slip right or slip left. It took a lot of practice and a total of five months of working together to get everyone into coordination.

We've been asked why, in view of these problems, we didn't use conventional aircraft instead of helicopters as our camera planes. The answer is that we did shoot from a B-17 on occasion, when we had simple left-to-right or straight-on plates to photograph. But for most of the shots you really

couldn't use anything but a helicopter because it was necessary to engage in "crabbing" maneuvers or rotate around the formation or slide between the planes. With a helicopter and a Tyler mount you can do things a conventional aircraft just can't do, and this allows you the flexibility needed for this kind of photography. We filmed a great many point-of-view shots and it was sometimes necessary to drop back and follow a formation. This means that we had to have something that could fly at a speed of *under* 100 miles per hour, as well. It's very difficult to maneuver straight aircraft at these slow speeds and maintain control.

Once in a while we shot at a less than normal frame-rate to speed up the action, but we did more *over*-cranking than *under*-cranking in an effort to smooth things out. When you are moving along with another object going at the same speed, and all you have to relate to is a background of sky or distant landscape, there's nothing to show how fast you're going—so this posed no problem. Our problems resulted from the tremendous turbulence that prevails in certain Pacific areas. The Tyler mount absorbed all of the vibration from the helicopter, but you can have the finest equipment, the best pilots and the greatest cameramen in the world and still be at the mercy of weather conditions. If it's too windy or the turbulence is really wild, there is nothing you can do to make your shots look right.

The roughest aerial sequence we had to photograph was one in which several planes, part of the command, are supposedly coming through Koli Koli Pass onto Wheeler Field. This pass, which isn't very wide, is the only opening from the windward side of the island. It works as a kind of funnel and all of the air comes roaring right through it. We tried on several mornings to shoot the sequence from a helicopter and it was just impossible. We abandoned that procedure and I tried flying through Koli Koli Pass in a B-17, figuring that we'd

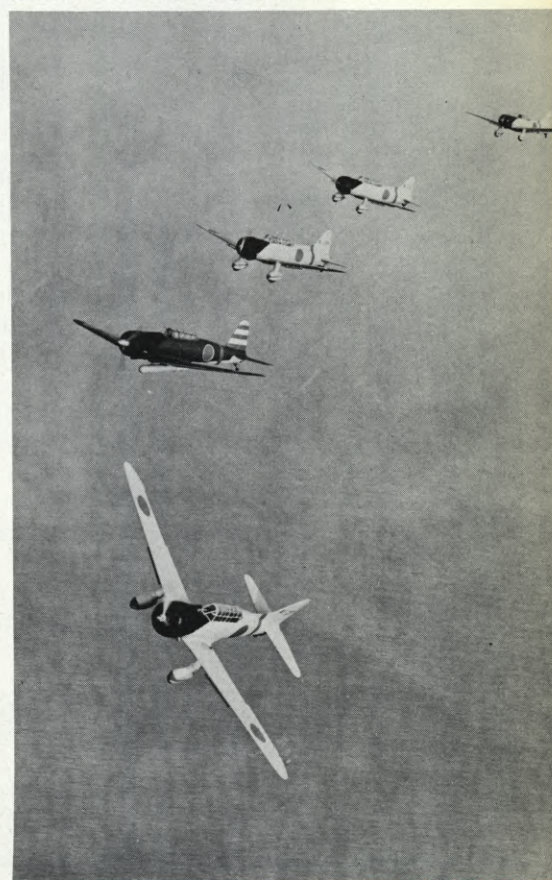
have more control because of the size of the plane. We had taken the back end of the B-17 out and rigged the Tyler mount in there, and I was trying to shoot the plate in that way.

On the first morning, we approached the pass with the planes in precise formation. Everything looked perfect until the minute we got into the pass itself. I was shooting with a 28mm Panavision lens, which has a very wide angle of coverage, but within one beat all of the aircraft were completely out of my frame. We had dropped about 500 feet in an instant. This is the kind of problem we were facing.

Finally, we decided that there was no way to get the shot except with a stationary camera. There was no road into the area and no place to land even a helicopter, so I had my brother ladder me down on top of Koli Koli Pass. I got part of the shots we wanted that way, but when it came time for him to pick me up the fog had moved in so densely that he couldn't see the mountain. I was stranded up there for a day, thinking that I was going to spend the rest of my time on top of Koli Koli Pass, but he was finally able to fly in and get me out of there.

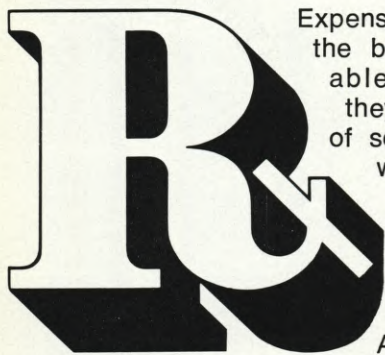
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Japanese aircraft peel out of formation to engage American planes in a dogfight. Author considers this one of the most exciting sequences which he photographed.



(ABOUT THE AUTHOR: Michael Butler, the son of veteran Columbia Studios Special Effects expert Larry Butler, "grew up" in the motion picture industry. Though only 26 years old, he has had several years of professional experience in filming commercials and as a stunt cameraman. With his older brother, David, he formed Vision Photography, Inc. when they received their assignment to photograph second unit footage for "TORA! TORA! TORA!". Upon completion of that work, they expanded the company to include another brother, Tony, and several others, and began to prepare their first feature as a photographic group. "THE CHRISTIAN LICORICE STORE", produced by Michael Laughlin, gave them the first opportunity to apply their commercial filming techniques to a feature production. Their second feature, "SIMON, KING OF THE WITCHES", for Fanfare Films, again utilized these techniques for feature filming and came in a week ahead of schedule. Vision Photography has now been expanded further to include a group of other film-makers, such as directors, writers and cameramen, with Michael Butler directing and photographing for the Haboush Company. Currently, Vision Photography is promoting the making of films as a "repertory" group.)

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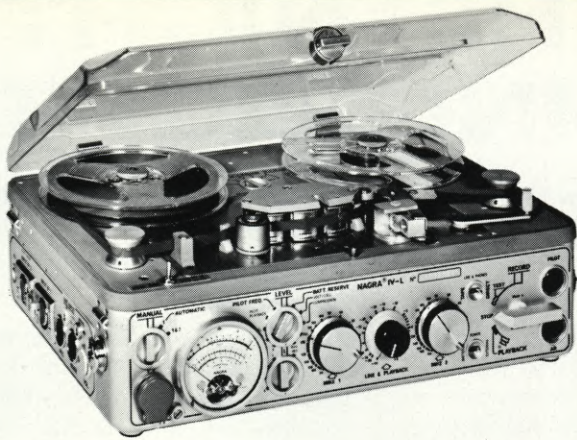
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"LIGHTING THE NIGHT" WITHOUT USING LIGHTS

By STAN NORTON, Film Prod. Supervisor
and ROBERT ROGERS, Cinematographer,

Jefferson Productions, Charlotte, North Carolina

How fast film stocks, considerable "pushing" in the lab,
and a heap of ingenuity made possible the filming of a
"real" documentary almost entirely with available light

A realistic motion picture produced by businessmen in Charlotte, North Carolina, is being used to make an important contribution to the fight against crime.

Entitled "LIGHT THE NIGHT", the 12-minute color documentary was produced at night, without the aid of artificial lighting. It was designed to demonstrate dramatically how well-illuminated exteriors can be a powerful deterrent to many categories of night crimes.

The Film Division of Jefferson Productions in Charlotte was hired to produce the film by the Charlotte Board of Realtors in conjunction with a national realtors "Light the Night" campaign. The basic goal of the production, as outlined by the Board of Realtors, was to inform and alert home owners, apartment dwellers and businessmen in our city to the many benefits of good lighting. The idea was to produce the necessary footage at night, under as realistic and authentic conditions as possible.

There was one other criterion which made this production unique. We were given less than 30 days to prepare a script, produce, edit and release the film in time for the kick-off of the "Light the Night" campaign.

The initial consideration that we made in our "Light the Night" project was the possibility of shooting day-for-

night by utilizing various shades of blue filters. Our first action was to make a series of day tests at the sites selected for production, with the full range of available blue filters. Our conclusion was that the effect was not realistic enough.

As a result, we decided to shoot the entire film at night with a minimum of artificial lighting. When the illumination at a site emanated from a tungsten light source, we used Ektachrome EF Film, Type 7242. When the illumination came from a daylight source, we used Ektachrome EF Film, Type 7241. We could have simplified production by standardizing on one or the other of these films and utilizing recommended filtering techniques. However, since the "star" of the film was realistic night lighting, even a shade of compromise between the actual and the documented scene was unacceptable. Our goal was total reality.

Production was separated into three stages, with one and two intermingled from hour to hour, because of the short schedule. They were:

1. Research, scripting, site location, shooting of test footage, and special arrangements for "actors" and aerial shooting.
2. Filming, processing, work-printing and editing.
3. Script recording, sound mixing, special effects, and commercial laboratory printing.

One of our first actions, after receiving suggestions from the Board of Realtors, was to contact the local power company and the Charlotte Police Department for technical advice and background material. We also made arrangements to record a news-type interview with the Police Department.

Simultaneously, we picked several residential and suburban areas as likely shooting locations. We drove through those areas, at night, and selected poorly-lighted blocks, stores and public buildings. At this point, the script had been outlined and we had a general idea of the type of shots that would be needed during two periods—dusk and night. As a guide, however, we decided to shoot about 150 feet of Ektachrome EF daylight film, which would be used for exterior shooting, and another 50 feet of tungsten film for experimental indoor illumination.

Film processing for the tests was handled in the company laboratory, using a Filmline processor and Kodak ME-4 chemistry. One of the advantages of in-house processing, aside from speed, was the flexibility of being able to "push" the film past the normal recommended exposure index.

Three cameras were used for shooting "LIGHT THE NIGHT", with an assortment of lenses. For synchronized sound we used an Arriflex-BL with a 400-foot magazine, connected to a

(LEFT) Successful utilization of available light in combination with Ektachrome EF film by Jefferson Productions for Boys Town Carolina commercial, provided test guide for Board of Realtors production filmed after dark in Charlotte residential areas. (RIGHT) A typical scene shot by low-level available illumination, typical of those photographed for 12-minute color film, "LIGHT THE NIGHT", produced as an important contribution to the fight against crime.



Nagra quarter-inch tape recorder and a directional mike. Two major lip-synchronized sequences were filmed—both in automobiles. The first of these occurred during the first two minutes of the film as a car carrying two women moved down a Charlotte street. Cuts to the inside of the car were shot with a Frezzo light positioned under the dashboard to simulate normal extraneous lighting. No attempt was made to light anything but the women's faces.

The second lip-sync sequence was the dramatization of a statement on crime and lighting by a policeman supposedly cruising his beat in a patrol car. In this case, we illuminated the front seat well with a Frezzo light and shot from a side angle to get the feeling of the patrolman actually talking to a passenger. This 45-second sequence was coordinated with the Police Department and a local police officer was used.

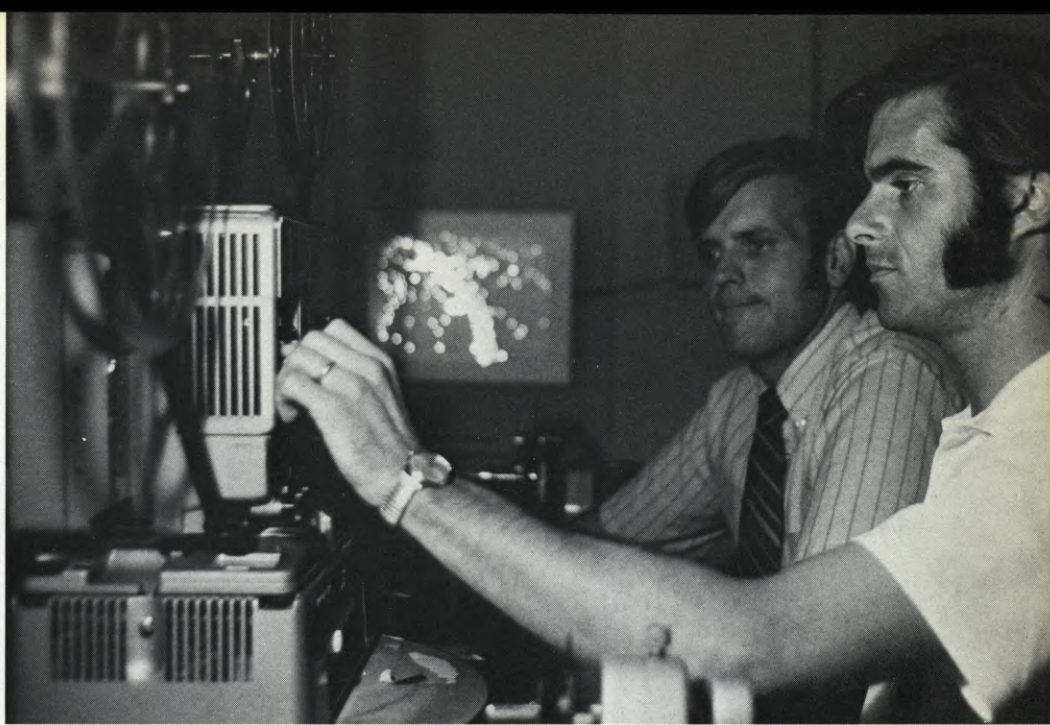
Both sequences were filmed on tungsten-balanced Ektachrome EF rated at its normal index of ASA 125. Exposures were set from a light meter and recommended processing was used. However, in much of the night shooting, light levels were so low that no meaningful reading could be taken. This is where our preliminary test footage came in handy. It had been shot at representative sites in those areas selected for filming. Following the result of daylight (7241) film tests, which were rated at an index of 640 (forced two stops in processing), we were able to shoot with virtually no film wasted due to incorrect exposures.

Exterior filming fell roughly into the following four categories:

1. Dusk, showing the city slowing down, preparing for night.
2. After-dark aerial shots of the city.
3. Lighted areas and crowd areas.
4. Inadequately lighted areas.

All available-light photography outdoors was completed using a tripod-mounted Bolex camera equipped with either a 10, 25, or 50mm lens. In a few instances, we also used a 12.5-to-120mm zoom lens. The use of the zoom was limited, however, because it was not fast enough. As a rule, most of the outside photography was exposed at F/1.6, at 24 frames a second, using the Bolex with 25mm and 10mm lenses.

Due to the mixture of lights available for night aerial shots, we decided to use Ektachrome EF daylight film. What we were looking for, and what we got, were strong colors—reds and yellows, especially—that are visible in most cities. They came from rooftop signs, such as on banks, stores, and service stations, and street lights. Many of the colors are



Previewing previous day's footage shot for "LIGHT THE NIGHT" are Film Production Supervisor Stan Norton (background) and Cinematographer Robert Rogers. The entire 12-minute color and sound production was completed within a 30-day schedule.

seen against a completely black background, when we flew over poorly lighted areas.

On the ground, black segments helped to give us the realism we were searching for. In one sequence, for example, using tungsten-balanced film, the Bolex and a 25mm lens, we traveled—a slow moving car was our shooting platform and dolly—from the front to the rear of a small grocery store. In front of the store there was a mixture of light including car headlights, fluorescents, and tungsten bulbs, while the rear of the store was lighted by a single mercury-vapor light.

Rating the tungsten film at 125, its normal index, we started our sequence with the fairly well-lighted shot of the front of the store, moved into complete blackness and then suddenly into a pale blue light at the rear of the building. Processing for this tungsten footage, and for all of the tungsten films used, followed manufacturer-suggested continuous machine procedures. Tungsten-balanced film was not pushed.

At the store, and in some of the residential shooting, there was a temptation to "fake" just a little illumination to kill the total darkness. Yet the whole purpose of the film was to direct the viewer's attention to Charlotte's lack of light. The concept of the film called for a contrast between homes or areas lacking sufficient lighting—dramatically shown by pinpoints of light from single windows in a row of otherwise dark homes—and homes bright with yard and under-the-eave illumination. For the most part, these shots did not have to

be staged since we had intentionally selected areas suited to the film.

The filming took about one and a half weeks, from late evening to approximately midnight, nightly. We were encouraged by the quality of the footage. Previous night's film was included in our regular processing schedule and was available after noon for viewing and critiquing.

In the daylight film sequences—rated at ASA 640—grain was hardly noticeable, for example, and color shift, which we were concerned about, was also insignificant. Being hypercritical of our own work, and the quality of the film image, we tended to analyze grain, definition, color saturation, and color shift in the production, as a guide to further use of Ektachrome EF in similar circumstances. Tungsten film color was rewarding. The quality of the prints was also very good.

Tungsten film was used for prowler sequences indoors and outside. Aside from one outside supplemental-light scene—showing a man's legs and feet walking along a sidewalk—artificial light was used in these instances for effect. Where a prowler goes from window to window, the interior of the room was illuminated with 650-watt photofloods to provide "spill" lighting on the man's face and chest.

A prowler ransacking a house was illuminated with a Frezzo light. Instead of carrying a flashlight and trying to fake the beam with a spot, we hid the battery case under the actor's coat, ran the power cord down his sleeve, and let

Continued on Page 186

A GOOD IDEA, THAT WORKS:

You change the NPR's magazine in 5 seconds or even less—and you don't touch the film.

Snap off the old magazine, check the aperture, snap on the new magazine. That's all. No threading; no loop to form; no blimp to climb in and out of. You don't need to touch the film at all. The film is threaded and the loop is formed inside the magazine when you load it, before shooting starts. The spring-loaded rear film pressure plate is on the magazine; the aperture is on the camera body. When you snap off the magazine, the aperture, registration-pin and claw are right before your eyes, visible and accessible for fast inspection or cleaning. Both double and single system magazines are available; and both types accept up to 400 feet of 16mm film on cores or daylight loading spools. The magazines are co-axial, and each side is light-tight. So, even with core wound film, most of the loading can be done in daylight. You can see what you're doing; and the whole thing is fast, easy and foolproof.



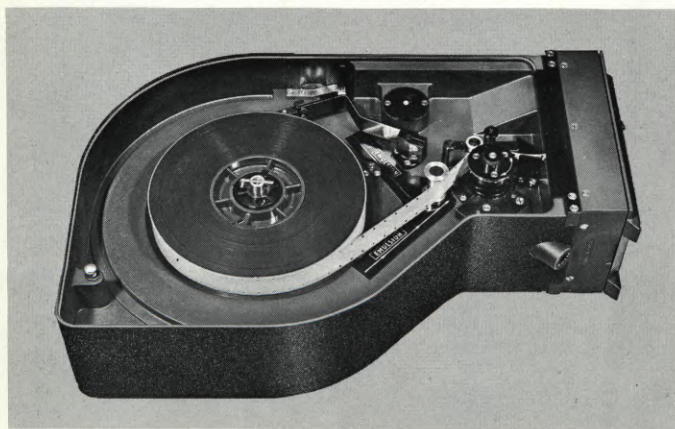
**RELIABILITY & PRECISION
PROVEN IN ACTUAL USE.**

A million and a quarter feet shot in eight months.

For the ABC TV show "Everybody's Talking," Hollywood cinematographer Baldwin Baker ran a million and a quarter feet of 16mm film through his NPR in eight months. That's 7,000 feet per day, five days a week. And he didn't lose a single frame.

Footage blown up to 35mm is "Stadiest ever seen."

The NPR's registration-pin holds vertical unsteadiness to less than one thousandth of frame height. Hollywood cinematographer Vilis Lapeniekas has seen much of his footage, shot for Wolper Productions, blown up to 35mm. His NPR footage is, he says: "Without a doubt the stadiest and sharpest blown-up image I have ever seen." All three television networks regularly use NPR cameras to shoot documentary and news footage. Vilis Lapeniekas recently used one to shoot an hour-long Tijuana Brass color TV Special with a \$750,000.00 budget.

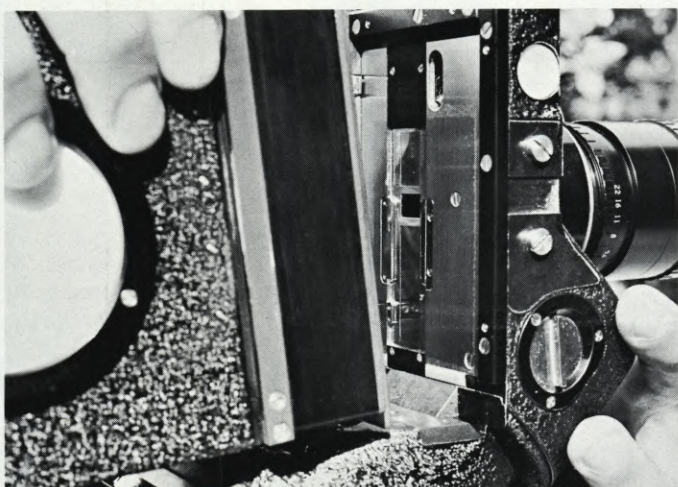


some notes on the instant magazine change.

**ACTUAL CASE HISTORIES
BELOW SHOW HOW THE
INSTANT MAGAZINE CHANGE
HAS HELPED FILM MAKERS.**

Unexposed gate survives blowing sand in desert.

New York film maker Michael Wadley took three cameras with him to shoot a mountain climbing expedition in Afghanistan. En route, he had to shoot in a desert, with sand blowing everywhere; but he managed to crouch under a coat and whip on a new NPR magazine in three seconds. The other two cameras, which had to be opened up and threaded, were both eventually rendered unusable by sand that got into their movements.



Changing magazines on the run—literally.

Shooting President Johnson's Far East tour for the U.S.I.A., Hollywood cinematographer Richard Moore said of his NPR: "When the President moved suddenly indoors, I was able to switch immediately to a faster film, literally as we followed him inside."

AMERICAN CINEMATOGRAPHER, FEBRUARY, 1971



Unobtrusive mag change doesn't disturb lions.

Shooting a Special on Africa for ABC TV, New York film maker Jerry Feil found himself within a few yards of a lioness and several cubs eating a newly killed antelope. By moving very slowly, Mr. Feil was able to slide off his empty, rear-mounted NPR magazine and clip on a new one without distracting the animals from their feed.

Catching unrepeatable action on Candid Camera.

Director Bob Schwartz reports that the shooting to aired-footage ratio on Candid Camera is about a hundred to one! The best action can't be repeated, of course, and often occurs at film runout. With earlier cameras, they used a system of secret warning lights, where possible, to let the interviewer know that he should stall the action while the hidden crew changed magazines. But with the NPR this is unnecessary, since the two-man crew can change the NPR's magazine in three seconds and let the camera's automatic clapper re-establish sync.

For an NPR brochure,
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The new Birns & Sawyer FILMOVAN rolls neatly into a world of tight budgets!



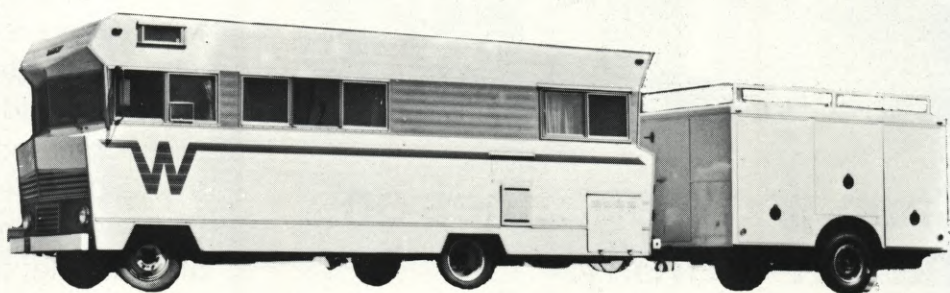
The new B & S Filmovan is 4,000 pounds lighter than its competition — easier and cheaper to fly-away to location. A 10' x 7' topside shooting platform is an integral feature. And when the unit is used with a motor-home, as illustrated below, the producer has all his equipment, plus dressing room, bath, air conditioning, conference room, etc., and still needs only one driver. The new Filmovan is a custom-fitted unit —

each piece of equipment has its own rack, hanger or drawer. Easy to set-up, easy to work, easy to wrap at the end of shooting. Door and interior lights make night work easy. Large, insulated, countersprung doors (fifty square feet on each side) swing upward to shield against sun and rain; they also give clear access to both sides of unit.

Hollywood's newest location filming vehicle is a saucy white and red trailer, called the FILMOVAN.

Except for saving money and effort in huge quantities, the pioneer Hollywood equipment firm of Birns & Sawyer makes no radical claims. The money angle is new — rent only the equipment you need and Birns & Sawyer throws in the FILMOVAN free

Birns & Sawyer designed and built the FILMOVAN as an on-set unit—to serve with a minimum of steps and effort—camera, grip and electrical crews. Insulated shade doors open to neat compartments (350 cubic feet of intelligently designed space to *hold everything you need*) — the most modern lightweight equipment: cameras, sound, electrical and grip, dollies, tracks, tripods, lights, ladders and lenses. Easy to move without fuss from setup to setup.



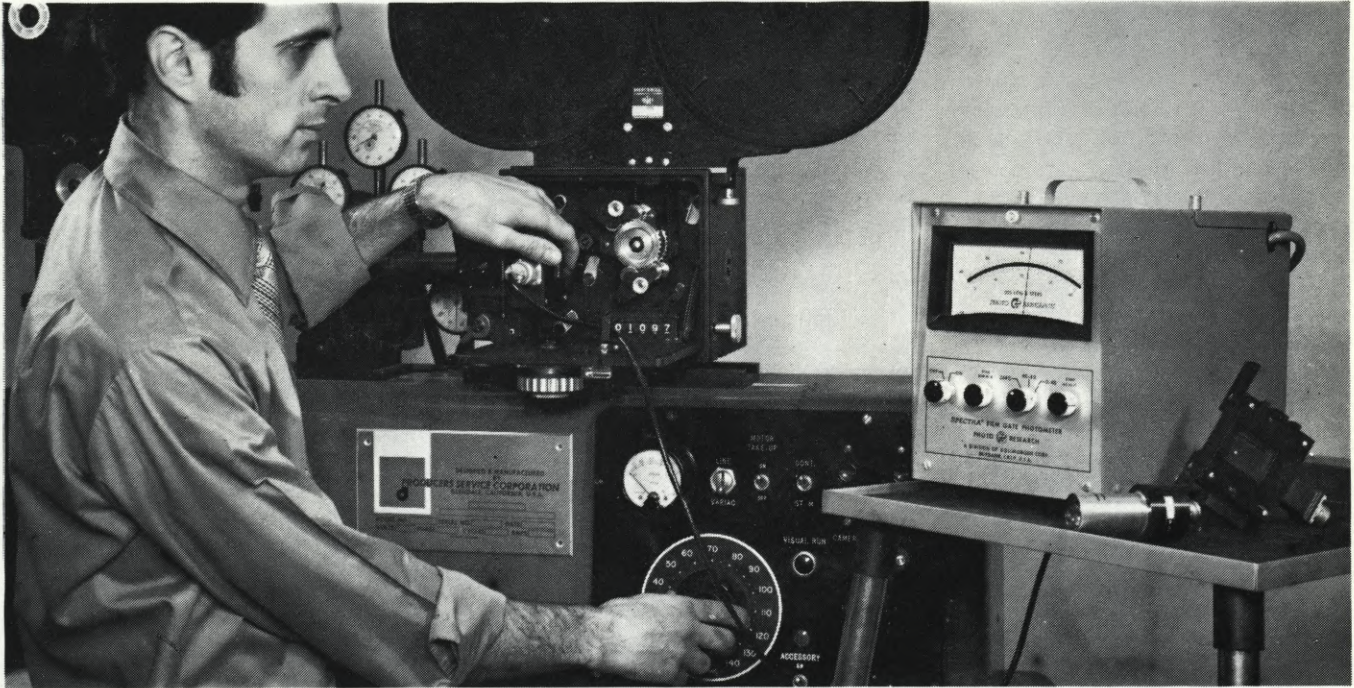
The FILMOVAN has its own brakes, hooks on to any heavy-duty pulling vehicle. No engine, transmission or rear-end to wear out, fail or cause other trouble to hold up assignments. Try it. It's different. It's also free.*

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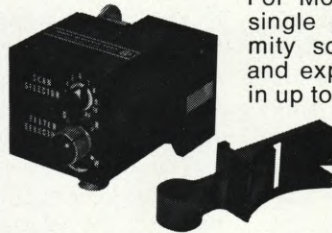


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provided for probes. Design permits adaptation to other optical and contact printers.

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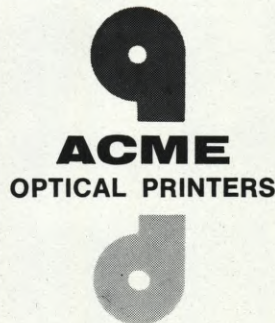
For Model "C" contact printers, a single probe provides field uniformity scanning plus color balance and exposure control measurement in up to 10 separate positions for the color primaries as well as white light.

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A UNIQUE SCHOOL FOR NEWS FILM CAMERAMEN

At last—a professional training facility devoted exclusively to teaching skills basic to TV—news and documentary filming

By ROBERT T. SCOTT

*Program Director, Motion Picture & Education Markets,
Marketing Education Center, Eastman Kodak Company*

The television industry in recent years has become one of the major consumers of motion picture film, particularly in the areas of news and information programming.

This is so for a number of reasons, but the prime one, perhaps, is that film and filming equipment are more portable than their electronic counterparts. Less equipment is required to produce a high-quality image, which means motion picture cameras can go anywhere with ease, from the jungles of Southeast Asia to the interior of a Washington office.

The element of immediacy has been licked with the development of new films and chemical processes that can bring us the visual image and optical sound track in less time. These new developments have meant, however, that there is more to know about films and equipment than ever before.

At Eastman Kodak, we have always been involved in training people in the motion picture field. In the past, we have offered programs in broadcast, industrial and educational fields. This included basic newsfilm training for the television industry; audiovisual planning, production and presentation techniques for educators; motion picture processing training for commercial laboratories, television and audiovisual companies; and industrial motion picture training for industrial photographers. The scope and depth of these

efforts will be expanded when we open our Marketing Education Center at Riverwood, in the Rochester suburb of Henrietta, New York.

MEC courses are designed to particular objectives and so are tailored to specific customer needs. The key element in all the programs is flexibility, both in the teaching facility and the teaching method.

The basic newsfilm workshop for television people is a good example of this flexibility. Varied educational techniques are required to train news cameramen to operate silent and sound cameras, to determine correct exposure, to use sequence and proper contrast and lighting ratios essential for quality television rendition of newsfilm.

While "hands-on" practical experience is emphasized in this course, we also use demonstrations, programmed learning, role playing and guest lecturers where these methods provide the most effective learning experience.

The newsfilm program will be offered ten times next year, with up to 24 persons attending each session. Only newsfilm cameramen sponsored by television stations are eligible.

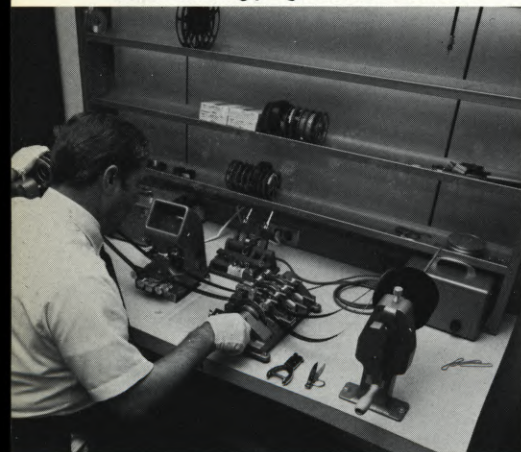
The course develops in cameramen an understanding of the contrast limitations of the television system, and it provides a systematized approach to preparing film that meets television's needs. It covers everything from expos-

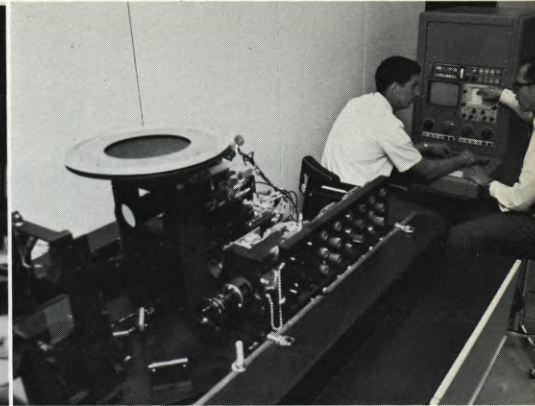
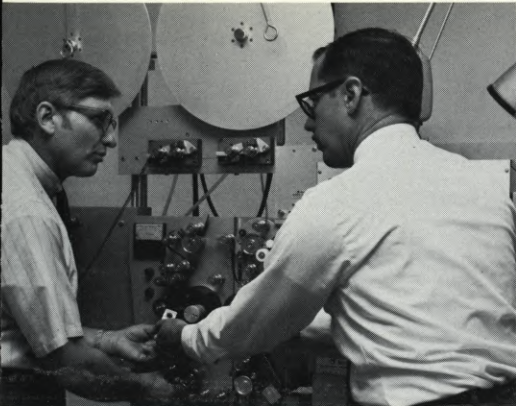
ure of film to editing, continuity and assembly for final presentation on the air.

One of the major advantages of the Riverwood center will be the availability of specialized equipment. Workshops are being developed for teaching media design, production and use. The complete motion picture studio and lab will allow production of a film, its processing, projection and TV display all in one day. As a result, participants will be able to learn a technique, study their attempts and correct mistakes all in one day.

Riverwood's facilities thus will permit more extensive work with both photographers and technicians for television film work. The Riverwood MEC contains a complete TV film chain which provides an unprecedented opportunity for students to see the results of their work just as it would appear to a home viewer. While television review room equipment providing an approximation of the system's impact on filmed images has been used in the MEC programs that tour the country, the TV chain at Riverwood will provide actual experience as opposed to simulation in the Rochester-based MEC programs. Such film chains exist elsewhere, but not in a system devoted to teaching. At Riverwood, the electronics side will be integrated with the film side of broadcasting—in the most comprehensive

(LEFT) A TV cameraman attending a Basic Newsfilm Workshop at Kodak's Marketing Education Center has the opportunity to shoot, edit and critique his film—all in one day. (CENTER) The author (far right) explains the operation of the flow meter on a picture processor to two customers attending training session at the Center. (RIGHT) Sophisticated equipment, such as this multiple-channel sound mixing console has been installed for use in training programs at the Center.





(LEFT) Trainees at the Center will have the opportunity for "hands-on" practice. Here, Robert Scott (right), MEC program director and instructor, demonstrates operation of Bell & Howell Model C additive light-source, high-speed punch-tape reader printer. (CENTER) A newsfilm expert explains the various filters that can be used with Kodak Ektachrome EF, Type 7242 film. (RIGHT) A trainee becomes familiar with the function of a color Tele-cine chain.

training facility of its kind.

MEC will provide such advancements in teaching as side-by-side viewing of television-displayed and direct projection images to further the student's understanding of television production systems. This will be done by interlocking Magna-Tech projection and dubbing equipment with the Eastman Model 285 Television Projector feeding a General Electric Model PE-240 color television film camera.

A companion program to the newsfilm workshop is the new ME-4 and ECO-3 process operation and control workshop. Here technicians are trained to install, operate, control and troubleshoot motion picture film processing equipment. The intent is to make the technician relatively self-sufficient in solving his own processing problems, while upgrading his practical technical ability as seen in the end product: quality processed film.

The advantages of MEC for these types of programs are numerous. The facility is as flexible as the teaching methods used in it. This flexibility is made possible by the design of the complex itself.

Working in conjunction with the Chicago architectural firm of Skidmore, Owings and Merrill, Kodak analysts made sure the four-building, 360,000-square-foot Riverwood MEC could be rearranged for almost any educational purpose. The complex is comprised of an administration and reception building, a pavilion-type dining building, a seminar and lecture hall and a hands-on laboratory building.

The administration building, which will house nearly 200 staff members of MEC, features "landscaped" office interiors that use furniture arrangements, acoustical screens and flower planters instead of traditional office partitions for walls. The dining building has tiered

seating and looks northward to the Genesee River through a two-story high glass wall. The main room can be converted for seating up to 500 people for large group gatherings, and a projection screen can be lowered in front of the window for motion picture and slide projection.

At Riverwood, all interior walls have been eliminated in teaching and laboratory areas. Moveable partitions have

been engineered with wiring overhead so that once a wall is in place, its switches and outlets are "hot." Special troughs carrying plumbing and chemicals for lab work are concealed beneath the floors of the laboratory building at 21-foot intervals.

The labs also have preplumbed sink units and modular cabinets that permit rearrangement quickly and easily. This

Continued on Page 182

Trainees at Kodak's Marketing and Education Center learn by doing. Here a crew is shown in the process of shooting a film demonstrating the operation of the Bell & Howell Model C printer, one of the many advanced pieces of equipment used in courses offered at the Center. A variety of teaching methods ranging from individual instruction to laboratory practice are employed.





(LEFT) Approximating the size of a basketball, a styrofoam sphere 12 inches in diameter was purchased from a local florist supply house. (RIGHT) The mock basketball was then cut into two precisely equal pieces for camera installation.

A BASKETBALL CAMERA

... or "Through the hoop with Gun Camera"—a bit idiotic from the dramatic standpoint—but technically rather interesting

What may well prove to be the ultimate "point-of-view" shot was executed recently during filming of the BBS Production, "DRIVE". Rather violently subjective from the audience standpoint, it presented a basketball-eye's view of what it feels like to be thrown through a basketball hoop.

For jaded spectators who have long yearned for just such an experience, the resultant shot should be a trip and a half. For film technicians, details of the rig that had to be whopped up to achieve so bizarre an effect might prove even more interesting.

At the request of Director of Photography Bill Butler, Gordon Enterprises' technicians fabricated a camera in the

shape of a basketball. A styrofoam ball 12 inches in diameter was purchased from a local florist supply house. A GE55C 16mm Gun Camera was selected because of its small size and light weight. A 9.5mm Angenieux lens was used in the specially modified "C" mount turret.

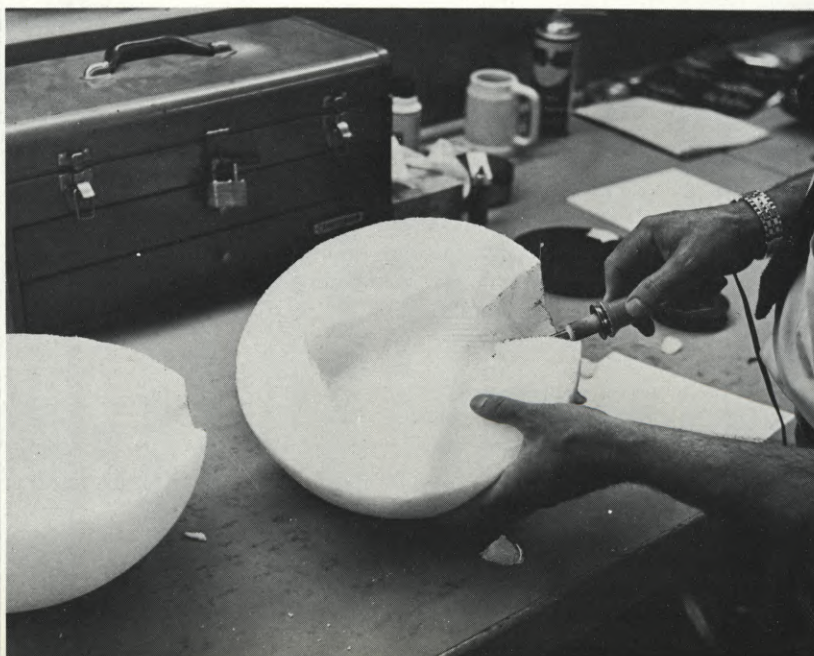
After the styrofoam ball was cut into two pieces, an electrically heated knife was used to cut a "pocket" to the exact outline of the camera. To achieve a center of balance, both halves of the ball were hollowed out, thus centering the camera in the ball. A hole measuring five inches in diameter was then cut in front of the lens, and was painted black to eliminate reflections.

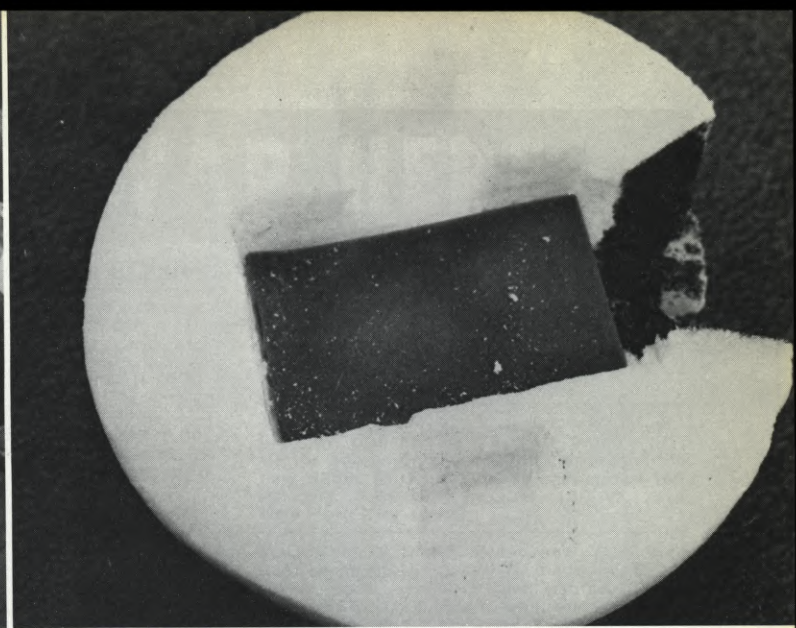
Two special nickel-cadmium batteries

measuring only 2" x 2" x 2" were selected to provide the necessary 12 volts to run the camera. The batteries were set into the ball on each side of the camera and wired in parallel to the power plug. A small switch was then indented into the outer surface of the ball and wired to the battery. This provided easy start-stop capabilities for the operator without the danger of accidentally starting the camera.

The ball was sealed with gaffers tape and instructions printed on the white surface indicating the top and bottom alignment for the camera operator. Less than 24 hours elapsed from the receipt of the order to the shipping of the completed "Basketball Camera" to the location in Eugene, Oregon. ■

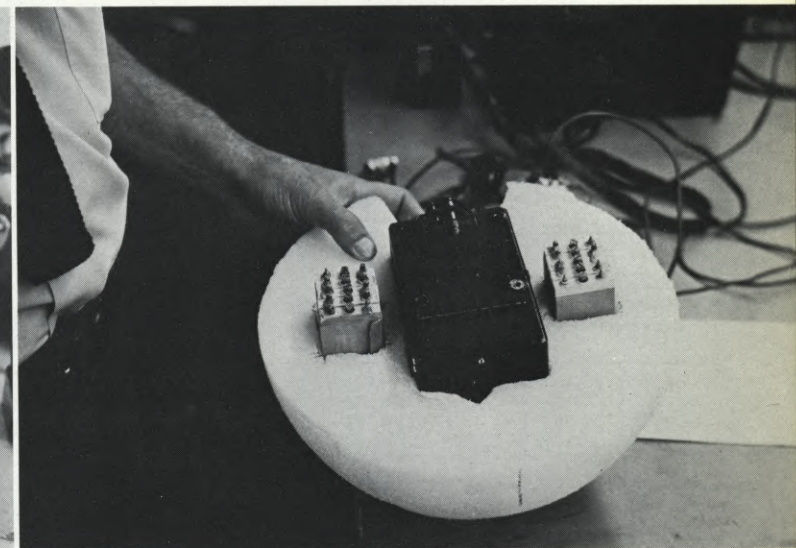
(LEFT) A GE55C 16mm Gun Camera was selected because of its small size and light weight, and its outline traced onto each half of styrofoam ball. (RIGHT) An electrically heated knife was used to cut "pockets" for camera.



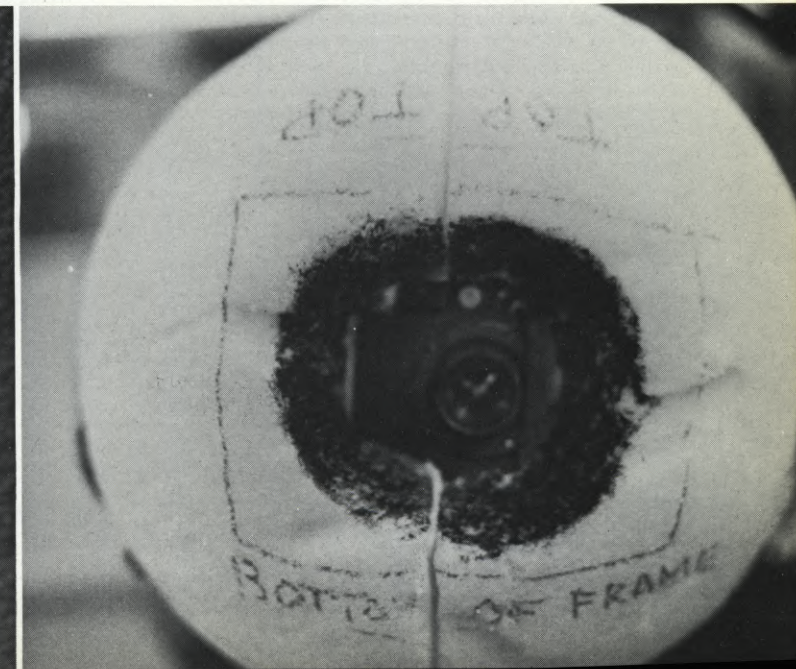
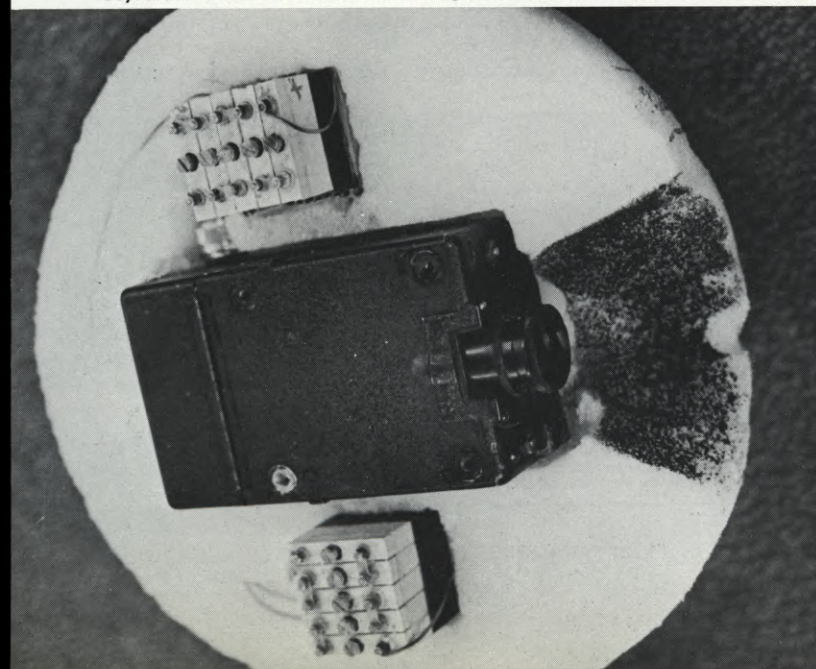


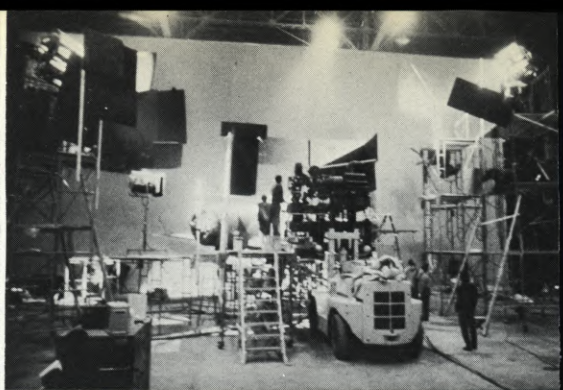
(LEFT) To achieve a center of balance, both halves of the ball were hollowed out, thus centering the camera in the ball. (RIGHT) Pockets were padded and funnel-shaped opening for 9.5mm lens was blackened to cut reflections.

(LEFT) Two special nickel-cadmium batteries, measuring only 2" x 2" x 2", were selected to provide the necessary 12-volt current to run the camera. (RIGHT) The batteries were set into the ball on either side of the camera.

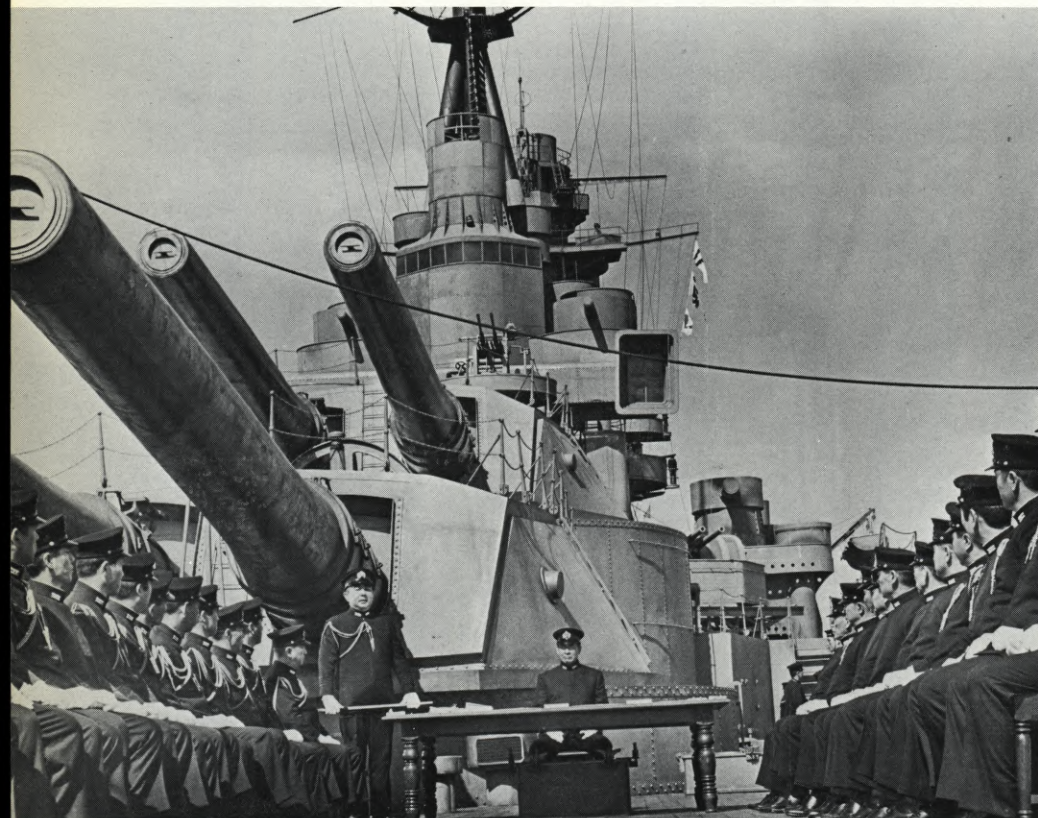


(LEFT) The batteries were wired in parallel to the power plug. (RIGHT) A small start-stop switch was indented into the surface of the ball. Styrofoam sections were sealed with gaffer tape and marked for "top" and "bottom".





(LEFT) Moving a Japanese Navy "Zero" fighter plane into position for the filming of a Special Effects scene. (CENTER) Director Toshio Masuda and Director of Photography Shinsaku Himeda scout locations along the beachfront at Ashiya. In background can be seen two giant replicas of Japanese warships built for the film. (RIGHT) Front-projection system set up in one of the large halls on the site of Osaka's Trade Fair, converted for use as a temporary Special Effects stage.



Lead-off for filming of the Japanese Episodes, begun on the morning of March 3, 1969, was authentic reenactment of the historic change-of-command ceremony in which Admiral Yamamoto relieved Admiral Zengo Yoshida as Commander-In-Chief of the Imperial Fleet. Sequence was staged on deck of the *Nagato*, following speeches by Producer Elmo Williams and Associate Producer Otto Lang.

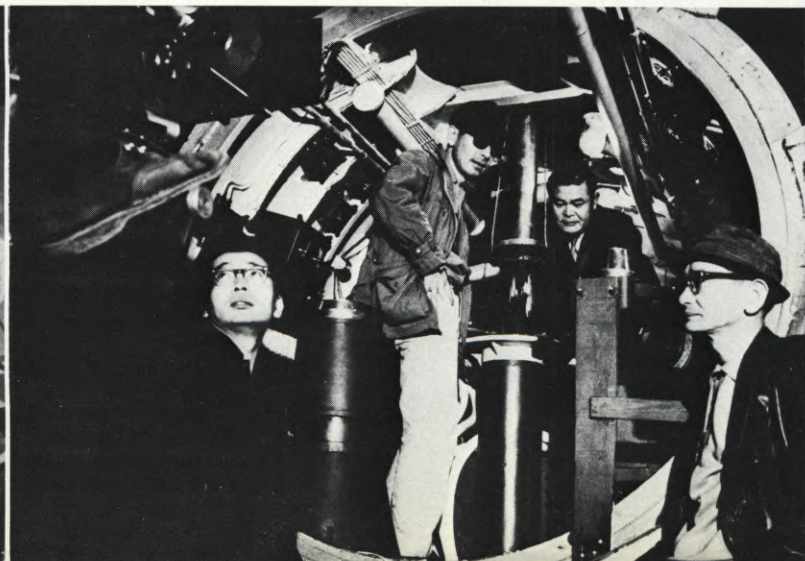
JAPANESE EPISODES

Continued from Page 143

Those scenes were planned to be composited later with miniatures of the fleet to be filmed in Hollywood. Osamu Furuya and his crew remained there for two weeks awaiting the proper weather conditions to conform to script instructions calling for the mountains in the background to be obscured by a snow-storm. Every day, from morning until evening, and with a cold wind blowing, they would wait with their cameras set up and the extras arranged on the beach, for the required weather condition to develop. But, unfortunately, those scenes were omitted from the picture during the final stages of editing.

At the same time, in Osaka, Director Kinji Fukasaka, L.B. Abbott, ASC, and Cameraman Masamichi Sato were working together on the special photographic effects. One of the large halls on the site of Osaka's Trade Fair had been converted into a stage for the front-projection process, with a screen 80 feet wide and 40 feet in height that was covered with 3M reflective material. Background images were projected onto this screen from a distance of 170 feet by means of a projector equipped with a 106mm

(LEFT) On sound stage of the Shochiku Studio in Kyoto, a cockpit scene involving a Japanese torpedo plane is filmed in front of a painted cloud backdrop, which was moved up and down mechanically. Special Effects Cameraman Masamichi Sato preferred this "old-fashioned" method to use of crane-mounted front-projection rig, which Otto Lang likened to "Gojira", a favorite monster of Japanese films. (RIGHT) Cinematographer Sato (extreme left) with his crew, preparing to shoot scene inside mockup of Japanese midget submarine.



CinemaScope lens.

The Special Effects assignment, as it related to the Japanese Episodes, was mainly one of compositing foreground aircraft action against backgrounds of sky and clouds, or other aircraft flying in formation.

Cockpit scenes of Lt. Commander Fuchida's "KATE" and other torpedo planes and of several "ZERO" fighters were shot in front of the reflective screen. In addition, some of the bridge scenes aboard the carrier *Akagi* and of the Special Attack Corps, trans-shipping from the I-24 (Japan's large ocean-going submarine) to the midget submarine, were photographed by means of front-projection.

A camera crane mounted with an optically-aligned BNC camera and projector was rigged with the expectation that it would be able to move about efficiently for photography of some of the front-projection scenes, but it was soon found that this consumed much more time than expected. Associate Producer Otto Lang called it "Gojira", after a famed monster of Japanese films.

The contract for the temporary use of this Special Effects stage expired on March 31st, so the operation was moved to the Shochiku Studio, Uzumasa, Kyoto, where retakes and additional scenes

were filmed by means of an old-fashioned technique by Masamichi Sato, who had given up on the use of the "monster" front-projection set-up. With the Mitchell Mark II camera (and sometimes a 35mm Arriflex), he shot scenes of torpedo-planes in front of painted clouds on a backdrop which was moved up and down mechanically. He exposed approximately 35,000 feet of Eastman Color Negative (type 5254) up until the end of April.

Hindered by rapid changes in the weather, day after day, Director of Photography Shinsaku Himeda continued shooting on the decks of the battleship *Nagato* and the aircraft carrier *Akagi*, which had been built on the beach of Ashiya. The exposed color negative was sent to the Far East Laboratory, Kyoto, for processing each day at 5:00 p.m. After the laboratory had printed "rushes", the negative was shipped immediately to Hollywood. The Japanese staff could see the daily rush print the following afternoon at 3:00 p.m.

When Shinsaku Himeda looked at the first rushes, he was discouraged to find that the color appeared washed out and seemed to have been over-exposed, although he had exposed it according to

Continued on Page 162



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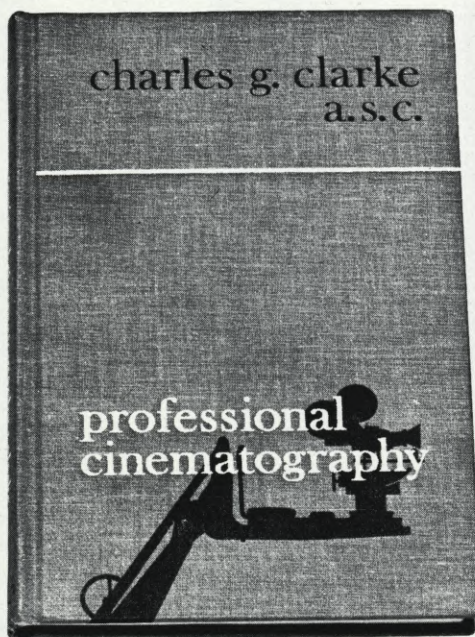
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ABOUT THE AUTHOR: Charles G. Clarke, ASC, a top Director of Photography at 20th Century-Fox for many years, and an ASC member, taught Advanced Cinematography at the University of California at Los Angeles, where he recognized a need for practical professional guidance for students striving to be the industry's future Directors of Photography. It is this need which has given rise to his publication of a book on the subject and subsequently the latest revised edition of Professional Cinematography. The first edition of this valuable book has become required reading at many universities and schools offering courses in cinematography.

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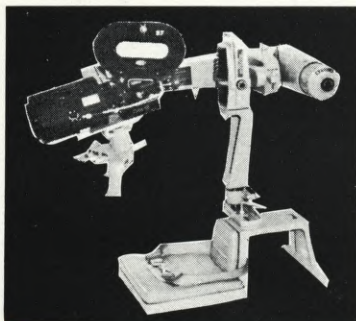
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CINEMA WORKSHOP

Continued from Page 114

certain wave lengths and transmitting others. Thus a red object absorbs blues and greens and *emits* red. Notice the word "emits" as opposed to "reflects." The red light that is emitted from a red object is being disbursed by the first few molecular layers of the object (FIGURE 3); it is not being reflected from the surface. This random emission appears as a soft, diffuse light source. On the other hand, a small percentage of the incident light never makes it past the surface and is reflected. Because this reflected light has not been affected by the coloration of the object it is "white"; all colors are reflected equally. This spectral reflection will tend to desaturate or wash out the vivid red color of the object, as can be expected whenever white is added to a pure color. Keep in mind that this spectral reflection is polarized, whereas the red emanating from the object is not. Thus by employing a polarizer at 90° to the surface of the object the vivid red will pass freely through the filter whereas the spectral reflection will be cancelled. Thus a polarizer can prove very beneficial in advertising and other product cinematography where the vivid colors of an object are extremely important. It also helps outdoors where it can improve the saturation of colored foliage, and especially water. A polarizer is also the only way to darken the sky in color photography, as light from a clear blue sky is polarized.

Remember that a polarizer always reduces the amount of light by approximately one to one-and-a-half stops due to the energy it absorbs. Experimentation will determine the correct compensating factors. ■

ANSWER TO LAST MONTH'S PUZZLE

John Whitney's article last month on his animation mechanisms contained seven numbered illustrations to explain his text. It was not his intention to make a puzzle game by transposing these illustrations out of their intended order. The editor wishes to express his apology for this and also for the switched footnotes. Sometimes the sequence from editorial to paste-up to photographer to printer resembles, somewhat, a game of roulette. For anyone who might still happen to be puzzled, or who has not guessed the correct sequence of illustrations, they are as follows:

FIGURES 4 5 1 2 6 7 3.

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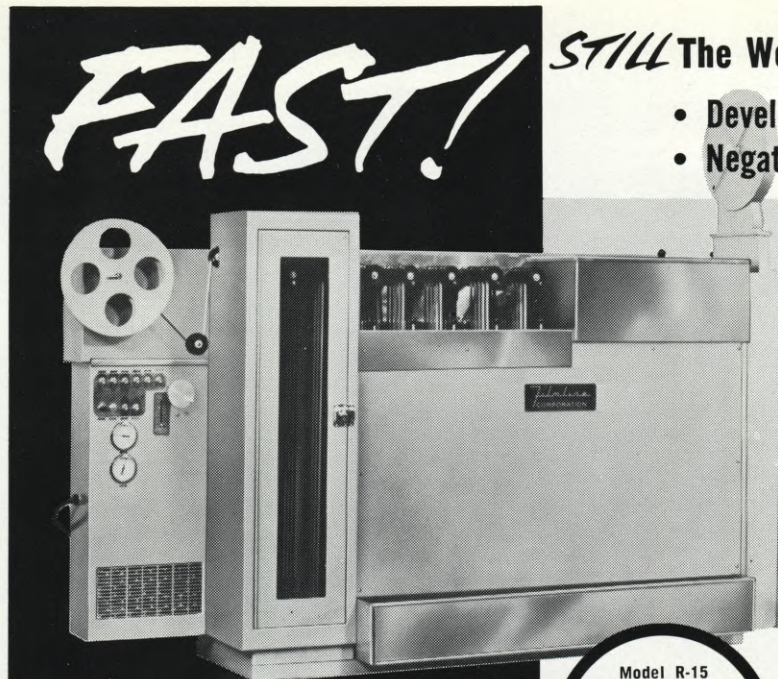
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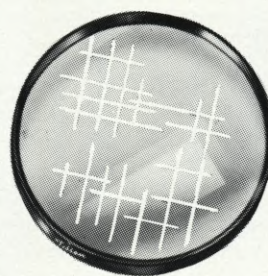
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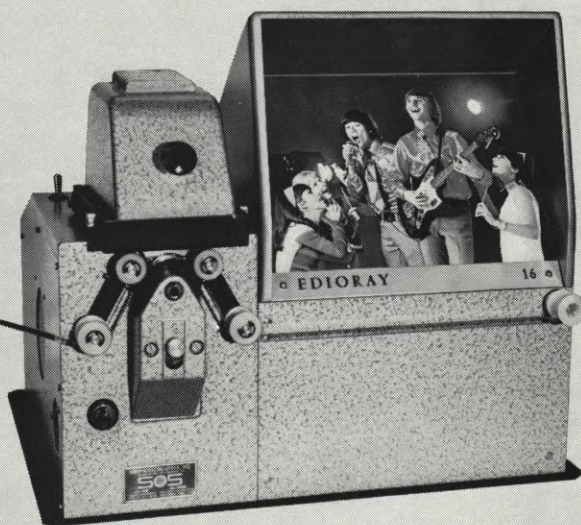
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JAPANESE EPIISODES

Continued from Page 159

instructions received from Hollywood. Thinking that there might be something faulty in the instructions he had been given, he sought and received permission from Associate Producer Lang and Director Masuda to use his own judgment as to the exposure. Everybody was satisfied with the beautiful quality of the rush prints that resulted from this procedure. But after three days, he received from Hollywood a message which indicated that his negative was now too thin to be blown up to 70mm. Realizing that Hollywood's original request for a somewhat dense negative had been based on this reason, he then reverted to his original exposure procedure with full confidence.

The staff of the main unit moved to the Toei Studio, Uzumasa, Kyoto, on March 31st and shot all of the interior scenes for the Japanese Episodes, finishing on April 4th. During this phase of the shooting, Himeda used the Panafocal 50mm-to-95mm lens exclusively because he preferred the quality of that particular lens. His filming apertures ranged between F/5.6 and F/8.

"For shooting a negative to be blown up to 70mm, I had to give utmost care to the sharpness of focus," Shinsaku Himeda told me, when we talked recently in a downtown Tokyo restaurant.

"When two actors sat face-to-face on the set," said he, "it was difficult to make over-the-shoulder shots, because I could not stop the lens diaphragm down enough to get them both into sharp focus. So I photographed them by means of double-role photography.

"I have been working with Director Masuda for a long time, and we usually have a discussion before photographing each scene. One day Associate Producer Otto Lang overheard one of these energetic discussions in Japanese and not being able to understand what was being said, he told Director Masuda: 'If you don't like this cameraman, you can fire him.' We both had a good laugh over that.

"I was very happy to undertake such an assignment," continued Shinsaku Himeda, "although we suffered from the tight schedule and the language barrier. But it was a great experience in my career—for which I thank the American producers."

Japan's most famous director, Akira Kurosawa, had originally been assigned to direct the Japanese Episodes for "TORA! TORA! TORA!", but when he became incapacitated, the direction of these sequences was taken over by

co-directors Toshio Masuda and Kinji Fukasaku.

In responding to this assignment, Masuda is quoted as saying:

"I took the assignment to uphold Japanese honor. We had made commitments on this film to the Americans; we had begun shooting it here. I did not think it right to walk away from the commitment. All of us believed it should be done with a Japanese director, using Japanese actors and technicians and made on Japanese soil."

It is ironic that Masuda agreed to direct a war film at all. While a student at Nihama Engineering School on Shokoku Island in 1945, he was expelled because of anti-militaristic attitudes. He was in basic training to be a *kamikaze* pilot.

"I sensed something was wrong and I couldn't agree to train for death without purpose."

In 1946 and 1947, Masuda studied Russian literature at Osaka Foreign Language College and aimed for a teaching career, but decided that film offered a better medium of expression. He began learning scenario writing in 1948, and soon became associated with Nikkatsu Studios. After seven years as an assistant director, at the age of twenty-seven, Masuda became the youngest full-fledged director in Japan.

"TORA! TORA! TORA!" is his fifty-second motion picture; his first for an American company. He directed the location scenes in Ashiya, and interiors at Kyoto.

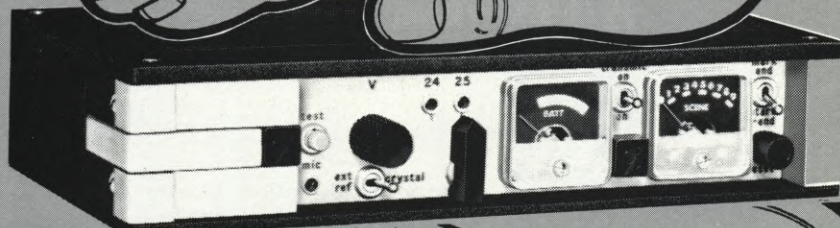
Like Toshio Masuda, teaching was the first goal for Kinji Fukasaku, co-director of the Japanese sequences. He was diverted from classroom ambitions to the motion picture after many afternoons and evenings in the neighborhood movie theatre, and enrolled in a film study course while in high school.

On graduation, he attended Nippon University's Cinema School and then eventually joined Toei Studios, Kyoto, as an assistant director. Eight years later, the 39-year-old native of Ibaraki Prefecture won his first job at Toei as a director.

With twenty feature films to his credit, Fukasaku believes he is "just beginning" in the Japanese industry. "In Japan, there is no such thing as an 'over-night' success in films. It took our finest directors many years just to receive credit within Japan, much less the rest of the world."

His only previous international venture was a science-fiction co-production called "BEYOND THE STARS". Fukasaku directed "TORA! TORA! TORA!" scenes in Osaka. ■

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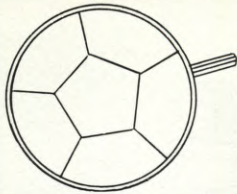


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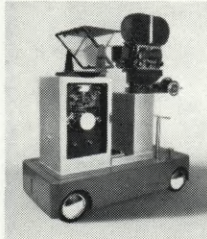
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Conducted by CHARLES G. CLARKE, ASC.
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(Inquiries are invited relating to cinematographic problems. Address: Q. & A., AMERICAN CINEMATOGRAPHER, P.O. Box 2230, Hollywood, Calif. 90028.)



Q When using mattes or masks before the lens for split-stage and other effects, how does one calculate the distance to set the mattes from the lens?

A There is no set formula for this reason that one type of split-screen shot may call for a soft blend at the matte edge (or where the two exposures join together) while another will require a fairly sharp matte edge. The closer the matte or mask is to the camera lens, the softer will be the line or lines of demarcation; the farther away it is, the sharper it will be. Using a small lens opening will also sharpen the line.

Q In motion picture and TV set lighting, what light source is called the key light?

A The key light is the main source of light, such as light from the sun, moon, windows, open doorways, lamps, etc. It is usually the light that is used for direction and modelling. The director of photography invariably key-lights his set first. In this procedure, he establishes the light pattern for the time of day or night and its mood. Regardless of the fill lighting used for emotional effect, one should try to be consistent in carrying out the key or source lighting on sets, faces and objects. This will give the illusion of naturalness in the photography.

Q What is the correct method to follow in taking a light reading on a motion picture set with an incident light meter: 1) at subject position with the meter pointed at the camera, or 2) at subject position with meter pointed at key light?

A Both methods should give the same result *provided* the incident light meter is the type with the hemisphere light collector, and that the flat-cell meter used to measure key light intensity is equipped with means to take into account the geometry of the illumination—that is, whether the key light comes from the front, side or back. In either method all set lights should be lit.

Q I have two questions: 1) Can 16mm color film be satisfactorily blown up to 35mm and if so, what would be the maximum size it could be projected?

2) If 16mm color film can be enlarged to wide-screen proportions, are closeups made from 3 to 30 feet recommended as more satisfactory than distant shots?

A Yes, 16mm film can be blown up to 35mm with success.

In answer to question No. 2, there is always some loss in quality and definition in any enlarging or "blow-up" process. Therefore, where maximum detail and definition are essential, it is advisable to stay as close to your subject as possible.

Q I am preparing to do some aerial photography in color, using a 35mm Bell & Howell camera and Eastman Color negative. How can I insure correct exposure? What filters, if any, should I use?

A Take a meter reading on bald blue sky, since any clouds that will be included in your shots will be the "hottest" areas in your pictures.

Three-quarter front cross-light is preferable for day shots, the reverse for night shots. When using Eastman Color film on exteriors, always use a 85 filter on your lens. When making day-for-night shots (night-effect shots filmed in daylight), use an 85-6. This will reduce daylight exposure two stops and create the desired illusion of night.

Q I have a 16mm camera which lately has been piling up film on the edge of the take-up reel. While the last 20 feet of film is running through the camera, it starts to pile up on the edge of the reel and continues to do so until the camera fully jams.

A It is likely that the take-up spindle on your camera needs adjustment. There are thousands of cameras in everyday use and the trouble you describe is rare. It would be advisable to

send your camera to the manufacturer's service department together with a detailed letter explaining your trouble.

Q I have seen the term "First trial composite print" in literature and would like an explanation of the term and a description of the type of print referred to.

A The first trial composite print is the first composite print made from the picture and sound release negatives for the purpose of checking and correcting picture and sound quality, negative cutting and assembly, etc.

Q What is the difference between "depth of focus" and "depth of field?"

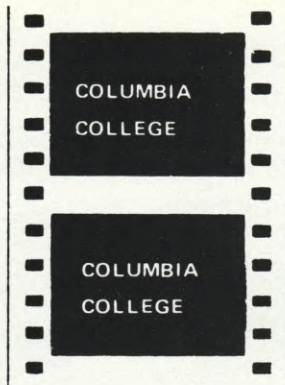
A Depth of Focus refers to the image space inside the camera. Depth of field refers to the object space outside the camera. The degree of depth is dictated by focal length of lens, the diaphragm opening, or both. Confusion between the two terms arises because people frequently and erroneously say "depth of focus" when they mean "depth of field."

Q When photographing store window displays with color film recently, the camera picked up my own image reflection in the glass, which did not seem apparent when I was shooting.

A Set your camera at an angle to the window instead of pointing it straight on—at about 35°. Other unwanted reflections, such as passing cars, pedestrians, etc., can be minimized by using a Pola screen in front of your lens.

Q What is meant by "color saturation"?

A Webster describes "color saturation" as "that attribute of chromatic colors which determines their degree of difference from a gray of the same brilliance, distinctness or vividness of hue." Saturation is actually the intensity or purity of a color. If, for example, a little gray paint is dropped into "pure" red paint, the red is no longer "pure" red. It has been slightly grayed. The more gray added the less pure is the red color, in comparison with the original red paint. The more a color is grayed, or "muddied," in a color print, the less color saturation it possesses in relation to the original color film. A print would have less color saturation, therefore, if its colors are weakened or less pure than the original colors.



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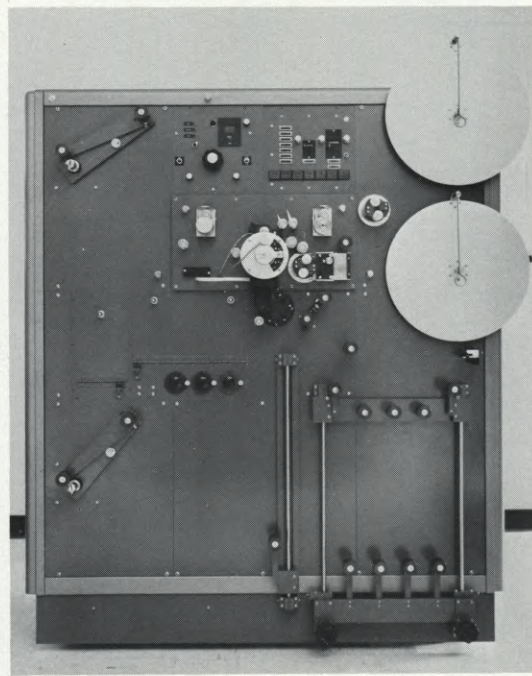
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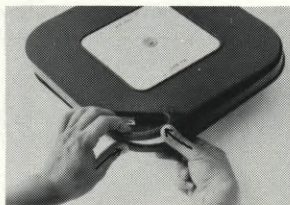


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Q Recently I photographed a number of scenes in a factory, showing machines in operation. The resultant footage was disappointing. Because the machinery was painted dark grey it failed to show up well, and the bright metal trim produced disturbing glare, bouncing light back toward the camera lens. What can I do to improve the photography of such a setting?

A This is the type of situation that is invariably met by all cameramen and the solution comes with experience —by trial and error. You could have the machinery painted a lighter color, then place lights behind the various machinery units to create planes of separation. The bright metal should be dulled with a spray solution now on the market for this purpose. Or lacking this, simply dab a wad of putty on the bright surface.

Q Our company has begun making 16mm color medical films. What methods are available to keep the lights cool on a set of this type?

A There are two ways of getting around the heat problem. First—if you are photographing the operating area, use a converter. With this setup you can dim the lights so that the heat will only be on the subject when photographing. I have photographed a number of medical pictures with the old 16mm Kodachrome which is a lot slower than Ektachrome. By using a converter I never had heat trouble. Another way of cutting the heat when using large units of light is the use of heat filters on the main lamps. A filter of this kind can cut out almost all the heat from a 10,000 watt lamp. The loss in color temperature is not over 150°K and it cuts no more than one-third of a stop on exposure.

MY PARTICULAR TIGER

Continued from Page 131

staffed largely by ex-navy personnel hired by the company. As the camera trucks and large equipment had to travel back and forth on the regular ferry, and wait their turn I might add, you can bet we left everything we could on Ford Island.

One other interesting bit of data. We kept in constant touch by means of walkie-talkies, as do most film companies, but during the aerial attacks, Dick Fleischer had a FAC (Forward Air Controller) standing next to him to instantaneously relay all messages to the pilots. This was necessary since they were operating on a regular radio frequency and it was necessary to have all instructions put in proper military terms to go out over the airwaves.

A great deal has been written about our major set, the million-dollar replica of the battleship, *Arizona*. It was brilliantly executed and was used also to simulate the *Nevada* and the *West Virginia*. Because it duplicated only the stern half of these ships it did present a challenge photographically, and several times we used the two navy destroyers to shoot across, particularly when it was being towed as the *Nevada*. After shooting for several months on this huge set, which was as high as a twelve-story building, and blowing it up piecemeal during this time, it was still a strange feeling to finally see the whole thing go up on the last day. It is not often that a cinematographer is asked to capture the tragedy and terror that this final day of explosions represented. Remember, too, that most battle scenes are laid out for maximum visual effect, but the objective of this picture was to re-create the actual attack and events as *authentically* as possible. I think it was done very honestly but "tastefully". By that I mean that the audience shared the feeling of horror and devastation but at no time did anyone try to slip into sensationalism or dwell on what will forever be an agony to anyone who lost somebody on that terrible morning.

It was a great satisfaction to me to have someone think enough of my abilities to entrust me with the responsibility of photographing a \$25-million-dollar picture. I think there have only been two or three others of this magnitude ever made. I received a newspaper review from a friend in Paris which said that the scenes of the destruction of Pearl Harbor will take their place in movie history. I hope so. It is a responsible picture and was an interesting, challenging and exciting job. ■

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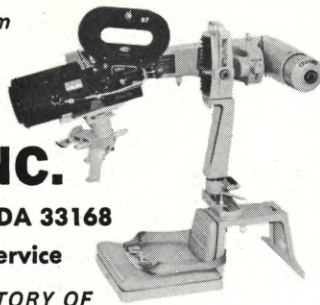
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"TORA!" SPECIAL EFFECTS

Continued from Page 141

depth of the tank, in this case, was only four feet, we couldn't actually capsize the model completely in a single cut—but it was quite easy to turn it halfway over, cut away to something else, cut back to show all of the superstructure supposedly under the water (we had removed it in the meantime) and then complete the 180-degree movement to show the ship bottom-side-up. The boys did a fine job of rigging all this and everything worked really well.

In order to propel the Japanese fleet through the water, we had equipped the individual models with golf-cart engines and these worked quite well most of the time. But when we got into the most violent portion of the storm sequence, with our wind machines and water agitation going full blast, these little engines couldn't give the models sufficient velocity to fight their way through. To solve this problem, we hooked the ship models onto underwater cables, in the conventional way, and moved them across the stormy tank by means of winches.

In the case of a fleet maneuver, you could obviously hook three or four ships onto the same cable pulled by a single winch, and they would maintain their relative positions consistently all the way across the tank.

Since some of the panoramic shots of the Japanese fleet showed as many as 15 ships on the screen at the same time, we did scale down some of the models in order to force the perspective. For example, we would have a row of destroyers in the foreground built to our established "full" scale. Perhaps 100 feet farther away from the camera there would be another row of destroyers. If the scale of the models in the background row were cut down to one-half the scale of those in the foreground, they would appear to be 200 feet away from the camera—or twice the actual distance.

Of course, we always try to use wide-angle lenses in an attempt to force perspective in miniature work. Unfortunately, the peculiar optics of anamorphic lenses prevent them from producing as great an illusion of diminishment as is possible with spherical lenses of comparable focal-lengths. In one black and white anamorphic feature, "SINK THE BISMARCK", we elected to shoot the miniatures with spherical lenses in order to take advantage of this increased diminishment, knowing that the scenes could be blown up and squeezed in the release printing. We had the duping

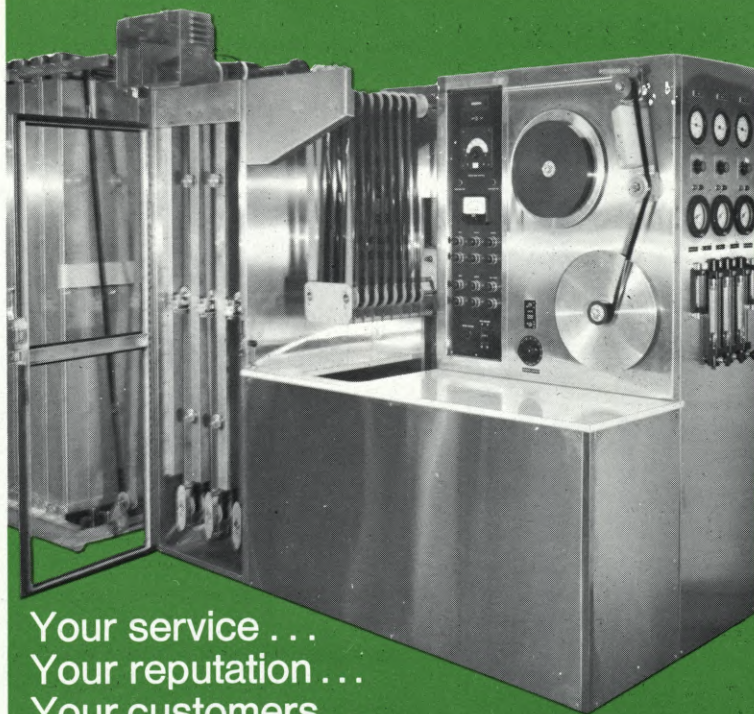
process down so well that we didn't really sacrifice any quality, and we gained diminishment.

For "TORA!" we had to shoot a lot of miniature scenes in which torpedoes are shown hitting the ships anchored at Pearl Harbor. We built the torpedoes and rigged them in the conventional manner. Each torpedo had an air hose and outlet, a cable to ride on, and a winch to pull it through the water. This works very well, but a problem arises from the fact that you need to create a water explosion for each torpedo that scores a hit on a ship. Since you can't homogenize water, the problem is to get these explosions to look real. One successful method is to fill a bucket with gypsum, attach a charge to the base of it, and then cover the bucket with Saran Wrap so that it won't leak. You place this bucket just below the surface of the water, in such a way that when the charge is fired, what you are actually doing is blowing small pieces of gypsum into the air instead of water. Of course, you can't hold on the cut too long because, when the particles start floating down (at highly over-cranked camera speeds), they fall so slowly that it looks ridiculous.

The tricky part about these torpedo scenes is coordinating the direct hits with their explosions and cutting away in time, while being careful to hold long enough to establish the fact that near-misses are also going on. It takes a bit of careful thinking and timing in this area to come out a winner.

It required approximately 40 days of shooting to complete the miniature photography for this picture. We shot the Japanese fleet and storm sequence in the early spring, when there was a lot of sunshine. The script, of course, called for an overcast approach all the way. We were able to beat the sunshine by means of the smoke and fog that we poured into the scenes, but we had a much greater problem to struggle with. When we revved up the wind machines for the storm sequences, the wind struck the water and threw up a continuous spray. The sun's rays hit the spray from just the right angle to produce almost constant rainbows—and these became a tremendous problem. We used to pray for overcast so that we wouldn't have to cope with the rainbows.

Contrarily, when it came to shooting the Pearl Harbor sequences, which were supposed to take place in full sunlight, we were well into the summer and there was a lot of overcast. I was somewhat disturbed about this until I realized, after a couple of days of shooting, that the overcast was actually working in our



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favor. When shooting in color you're not really dependent upon shadows for contrast; the subject matter can provide that for you. Since the sun was toned down, relatively speaking, the fires resulting from the explosions became more colorful and brilliant. This added to the appearance of the scenes, so that what we had thought would be a detriment actually turned out to be an advantage. We sort of fell upstairs that time.

We used both front-projection and blue-screen in making the composite scenes for this picture. The general procedure was that if we had the background plate available at the time, we would shoot the scene with front-projection. However, because of the time elements involved, the availability of various people and the general logistics involved in the making of this show, we sometimes didn't have the plate when the foreground action had to be shot. In a case like that we'd go blue-screen and worry about the plate later.

Occasionally, when we were dubious about the quality of a plate, or felt that we might like to change it at a later date, we would cover our operation by shooting it both ways. A discovery which we made, born of desperation, turned out to be a quick and easy way of doing this—and one which I feel other technicians in the industry might find valuable in their work.

On the front-projection stage which we had rigged in Osaka, they had built in front of the huge screen covered with 3M retro-reflective material an eighty-foot section of a Japanese submarine, complete with conning tower and a mini-sub at the after section. We had, obviously, planned to shoot this set-up as a front-projection scene—but when the plate for the background scene arrived, it unfortunately turned out to be improperly balanced. So, in desperation, the only thing I could think of was to try to turn the front-projection screen into a blue screen. I sent out for a couple of Eastman 47D gelatin filters to use in projecting blue light onto the 3M screen. We had been using correction filters such as the 10CC and 20CC in front of the projector light source and they survived all right because they were so light that they didn't absorb much heat. But when I put the 47D filter in front of the projector, it crinkled up like a piece of lighted cellophane.

I sent someone out to look for a piece of deep blue plexi-glass, but, in the meantime, one of the Japanese assistant cameramen came to me and, through an interpreter, suggested that

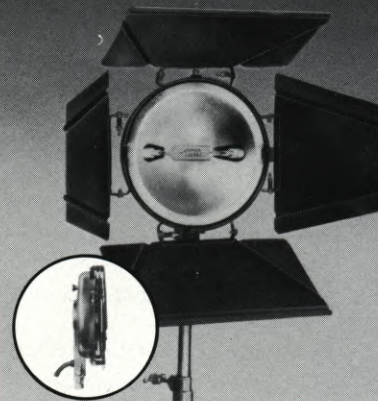
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we build a water cell, dye the water blue and use this as a filter. By this time I was desperate enough to try anything, so I told him to go ahead. We were scheduled to shoot the next morning and the boys worked during the night to build the water cell. It was about eight inches square and two inches thick—a bit large, but we felt that the more water we had the longer it would take to heat up.

The Japanese lad who had suggested making the cell came in with several shades of blue dye. We examined the color samples on the labels and picked one that seemed to be the correct shade. He mixed up a brew of the dye with water and we mounted the water cell in front of the projector. It turned out to be as good a blue as you could ever hope for. So we went ahead and shot the sequence and when it was finally put together it was very impressive. Unfortunately, it didn't end up in the final cut of the picture.

We did learn from that experience, however, that it is possible to turn a front-projection screen into a blue screen simply by putting a blue filter on the projector without any plate in it, and treating the scene as a normal blue screen shot. After that, when there was any doubt as to the quality or color balance of a background plate, we would shoot the scene both ways and end up with a negative of the foreground action for protection, so that we could add another background at a later date or change anything else we wanted.

This method of "creating" a blue screen offers an extra bonus, as far as I'm concerned. One of the biggest problems in blue screen work is trying to keep shiny surfaces of the foreground subject from reflecting the blue of the screen, because this leaves "holes" in the foreground subject negative that later have to be filled in by means of some tricky matting. The submarine we were shooting in the aforementioned shot had to be kept wet in order for it to look right. Ordinarily, blue reflections from the screen onto the wet surfaces would have added up to a giant headache. However, we found that the blue light directed toward a front-projection screen is *not* reflected onto foreground objects. This is because there really isn't any light on the screen, except for the intense beam that is coming from the nodal point of the lens and is reflected back directly along the same line. In other words, there are no reflections from any other angle.

We used front-projection quite extensively on this picture. For example, all of the Japanese air sequences in which

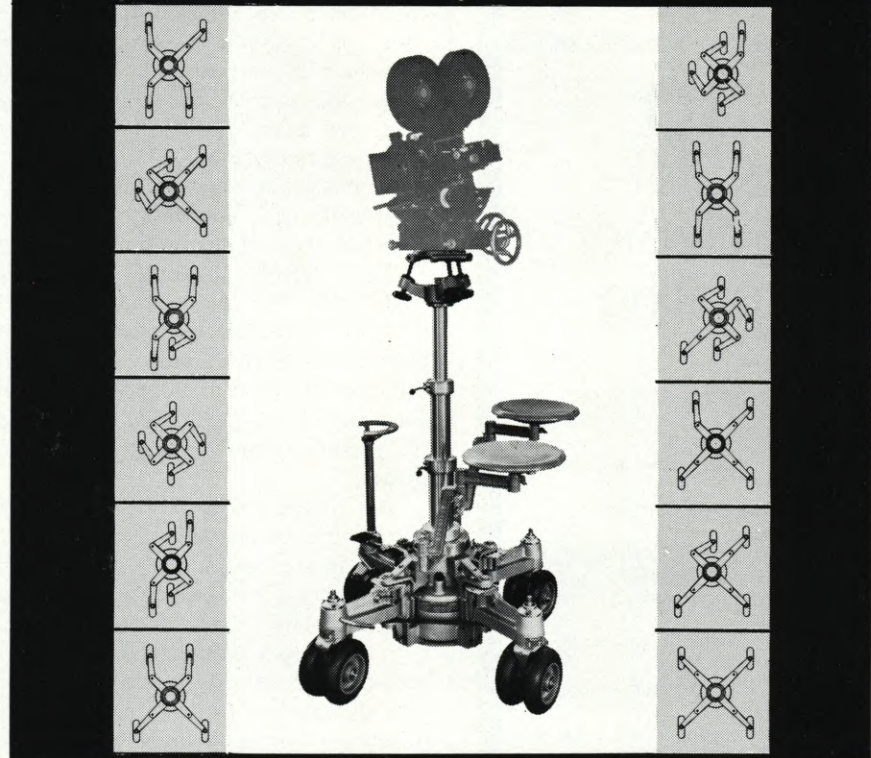
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you see other planes involved with the foreground characters were done with front-projection. The sequence in which Cornelia and her student get mixed up with the Japanese planes flying into Pearl Harbor was also front-projection. That sequence particularly interested me, because the director said that he would like to see her plane advancing a little bit across the screen instead of remaining in the same area of the frame.

Fortunately, when we built our front-projection equipment at 20th Century-Fox, I had mounted the camera and projector on a "table", so to speak, and this table could be tilted or revolved, with the camera and projector moving together. You could, for example, create the illusion of an object rising into the bottom of the frame (as long as you had enough excess screen), simply by tipping the camera-projector combination downward. Obviously, you could get a similar effect by panning—which is just what we did to make Cornelia's plane seem to be moving across the screen. We didn't have to move the plane itself at all, and the effect worked very well.

Commenting in general on the use of front-projection, as a result of our experience with it in filming "TORA! TORA! TORA!", I would say that it could offer tremendous advantages if someone were able to spend sufficient time and money to really develop it. But it would have to be backed up with good laboratory personnel, considering the possible pitfalls that are involved in its use.

One of the problems that can plague you in the application of front-projection is that of keeping the shadow cast on the background screen just as sharp as possible, in order to avoid ending up with a "fringe" around the foreground subject. Just recently it has been noted that the shadow problem can be minimized by having a diaphragm in the projector lens and stopping it down to an aperture of a smaller diameter than that of the lens on the camera. Obviously, as you collimate a light beam, it tends to throw a sharper shadow—which is essentially what you are doing by stopping down the projector aperture. In all of the front-projection work we did on "TORA!", we did not have the advantage of a diaphragm in the projector lens—so we had to work with our people quite close to the screen and use long focal-length lenses in order to cast shadows that were sharp enough not to be seen. If you are using the front-projection screen as a blue screen, as previously described, you must still be meticulous about the shadow.

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In my opinion, shooting the background plates in 65mm would be an important advantage, because it would provide an increased area of information that could be copied without showing grain. A wet-gate on the projector would be an extra aid in this respect (as it would, also, in rear-projection), and it would help eliminate scratches in the plates, as well.

Even without using 65mm plates, you can copy one-to-one quite acceptably (especially with a wet-gate projector), provided that you take the time to design your plates especially for this use and don't try to strain the system beyond its capability. Unfortunately there are a lot of people who, when they discover that they can zoom in front-projection, think this is great and proceed to do so. But when you zoom you enlarge the background, and its grain structure, as well. In front-projection you are copying what I call a "solid" image—that is, an image on a flat plane—so you do have good definition, but it's wise to stick real close to one-to-one in order to get a presentable dupe.

One important factor to be considered in shooting with an unfamiliar front-projection screen is that each batch of 3M reflective material seems to have a slightly different chromatic response—so it's wise to make a series of tests in order to establish the off-ratio for that particular screen. Also, we have found that in order for a neutral tone in the plate to match neutral tones in the foreground subject, the plate must appear to the eye to be a little bit pink. Just *how* pink is relative to the material you are working with.

I feel strongly that some method must be employed to control the contrast of plates to be used for front-projection, because they always pick up contrast in the reproduction. In rear-projection we can achieve rather good contrast control by letting a bit of ambient light hit the screen, but that doesn't work in front-projection. To my mind, the best way of flattening the contrast of the background plates is by pre-fogging or post-fogging the print material raw stock.

Despite all of these cautionary recommendations, I'm sure that within a short time front-projection will become an integral part of motion picture production. It can lend tremendous scope to a picture at a reasonable cost and has several technical advantages over current methods of creating composite scenes. In other words, it is far more flexible in these areas than anything we've ever had before. ■

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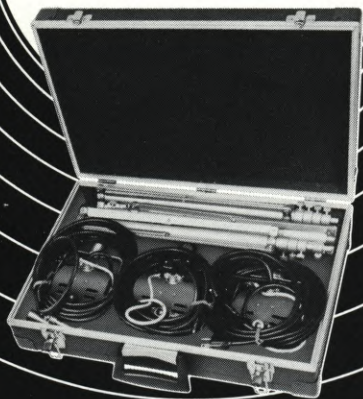
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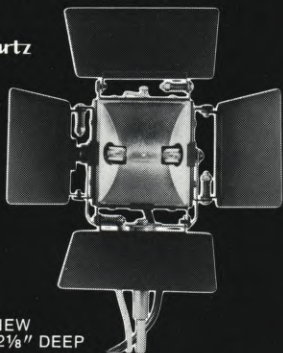


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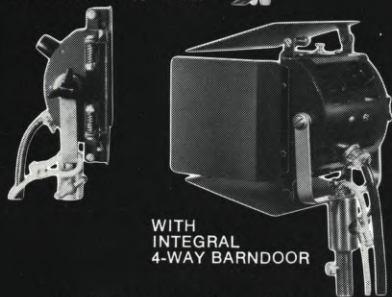
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FILMING "TORA! TORA! TORA!"

Continued from Page 127

Uniquely, one cover set was a Shinto shrine. Pilots aboard the real *Akagi* had prayed before such a shrine in the pre-dawn hours, December 7th, 1941.

Morning after morning, busses bearing college students ground over the sandy road from Ashiya to the ship sets. The students were drawn from campuses throughout Kyushu to portray sailors and junior officers of *Nagato* and *Akagi*. Filming in "The Year of The Hip," it was necessary to pay some of the students a bonus in order to crop long hair. Concern over the shears soon vanished as the extras, clad in summer whites, were assaulted by cold winds from the Hibiki Sea.

The production complex at Ashiya included a mess hall for the feeding of upward of twelve hundred extras a day; a wardrobe building to costume officers, enlisted men and pilots in 1940-period uniforms; a small production building to house director Masuda's staff, and a storage and maintenance area for the twenty-one aircraft of *Akagi* and *Soryu*. It was a crude and hibachi-heated but practical studio far away from headquarters in Kyoto.

Near the complex was still another set, an interior duplicating *Akagi's* hangar deck. En route to Hawaiian waters from Hittokappu Bay, pilots and bombardiers of the carriers practiced dummy bombing runs by dragging rubber sheets beneath bomb sights. Targets were painted on the sheets. Twelve full-sized aircraft became the "set decoration" for this unusual interior.

Japanese Locations

Ashiya Air Force Base, on the north-east coast of Kyushu at the mouth of the Toga River in countryside rather mountainous, and facing the Hibiki Sea. Not too far from the Tsushima Strait where Japan defeated Russia in 1905. Formerly a port for trade with Korea and China.

Ogano River, Geisha house scenes were staged on its banks.

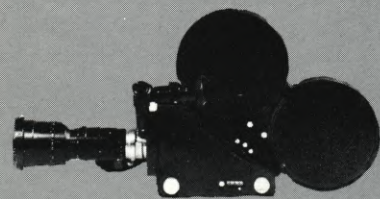
Iwanai, on the island of Hokkaido, faces the Sea of Japan, with the Okhotsk Sea at its back; roughly 150 miles from the Soviet Union territory of Sakhalin.

Kagoshima Bay, Kyushu, actual site of pilot rehearsals for the attack on Pearl Harbor.

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Interiors were also filmed at *Shochiku Studios, Kyoto.*

The American Production

Although preliminary work was begun in 1966, full preparation for the filming of "TORA! TORA! TORA!" got underway in early 1967. It is not unusual for a film of this size and scope to "be in preparation" for several years, although "TORA! TORA! TORA!" may have set a record in its time-stretch from 1966 to release in 1970.

Exhaustive research and writing, the marshalling of World War II vintage props, vehicles and aircraft; the search and authorizations for use of authentic locations; the vast planning for the destruction of Pearl Harbor and the acquisition of naval ships to be targets for the raiding aircraft easily consumed time, and by the December 1st eve of filming, much preparatory work was yet to be done.

The first footage to roll for "TORA! TORA! TORA!" passed camera gates December 2, 1968, aboard the aircraft carrier *Yorktown*, portraying the Japanese carrier *Akagi*. The reason *Yorktown* was used: Japan has no aircraft carriers! Although it is the first time the Japanese national flag has ever flown from a United States naval ship at sea, the flag was on a halyard mounted on a jury mast on the flight deck. The United States flag was never lowered nor removed from its normal position. Take-offs of thirty "Japanese" aircraft representing the Pearl Harbor strike force were accomplished on the dawns of December 3rd and 4th.

Washington, D.C. filming began on a date well-remembered, December 7th—shots from the top of the Washington Monument, establishing the nation's capital on a grey morning. Re-creating the historic and pertinent events between Mid-January, 1941, and the afternoon of December 7th, the cameras ranged over the official city from "Old Navy" and "State" and the Japanese Embassy to the White House. They went into Rock Creek Park, strewn with autumn leaves, to glimpse "General Marshall" riding "King Story," the Dalmatian "Fleet" trotting behind; to State as Ambassadors Kurusu and Nomura enter to deliver the famed Fourteen Part Memorandum to Secretary of State Cordell Hull. Hour by hour of the face of that tense weekend was relived in two weeks of concentrated filming.

"Exterior, Sky, Japanese Air Armada, 1st Wave," was the initial day's work in Hawaii as the third American phase of "TORA! TORA! TORA!" began on January 20th, 1969, with thirty

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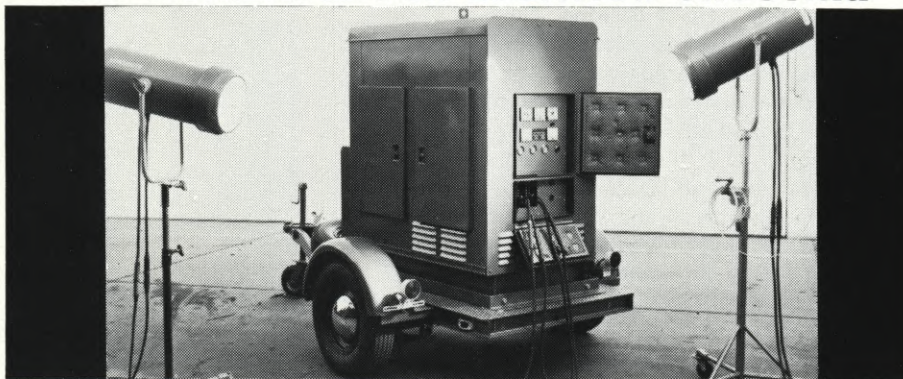
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aircraft aloft from Barbers Point Naval Station at dawn. It was the start of weeks of aerial and ground second company photography with exact duplicates of the Japanese "Zeros," "Kates" and "Vals" that bombed Pearl.

Hawaii "Studio"

It was somehow appropriate that "TORA! TORA! TORA!" should find a filming home in Hangar 79 on Ford Island. Leased from the U.S. Navy, the huge building, mostly vacant since the strip was de-activated, provided space for set building, make-up, wardrobe, special effects, property, staff, transportation—all the intertwined departments of modern movie making. Hangar 79 had a few scars from the original attack. It had mutely witnessed the screaming fighters and bombers; now it was host to the construction of such widely varied items as Japanese midget submarines, plaster bomb craters and fibreglass fuselages for P-40's as the clock turned backwards. Upwards of three hundred technicians labored daily in Hangar 79 to keep pace with production. Fifty-odd cars and trucks, many hauled from junk heaps, were refurbished to vintage '41; set dressing for "USS Arizona" and the "Tennessee mast" moved through 79's machine shop; life-rings for "Nevada", nameplates for "West Virginia" and "California" came out of her sign shop. Big 79 was, in all ways, a studio away from home. Stretching from her was the production web that reached nearby "Battleship Row," where the real "Arizona" still oozed oil and the more distant twenty-two Hawaiian locations that included Wheeler and Hickam Fields, Schofield Barracks and Fort Shafter, all legendary names in the Pearl Harbor story.

The Locations

Battleship Row was, of course, the main filming location for the Hawaii sequences. Save for the quiet and pristine *Arizona* Monument and the rusting remains beneath it, little has changed along the empty mooring quays since that December morning. One almost senses the ghosts of *Oklahoma*, *Maryland*, *West Virginia*, *Nevada*, *Vestal*, *Neosho* and *California*: the torpedo streaks across channel, the earth-shaking explosions and balls of flame; the oil-fed smoke and the cries of wounded. Over it, the enemy aircraft calmly and determinedly pushing triggers.

The re-creation of the attack along Battleship Row was probably the most complex operation in film industry an-

Continued on Page 178

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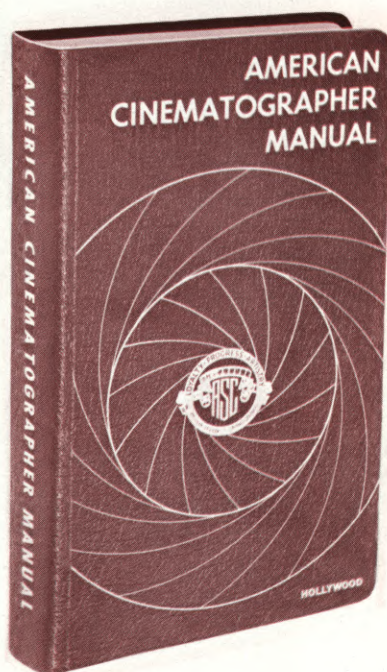
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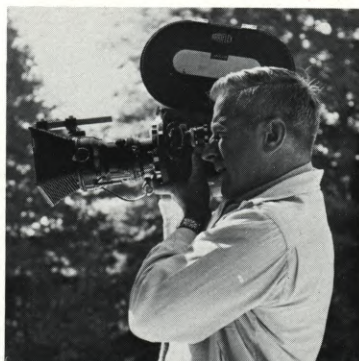
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FILMING "TORA! TORA! TORA!"

Continued from Page 176

nals. Certainly, by area and the size of the sets, one of the largest operations ever to go before cameras.

To achieve authenticity, a full-scale section of *USS Arizona* was built by the Maritime Services Division of the Dillingham Corporation, Honolulu. Mounted on two steel barges, the 309-foot steel super-structure, fully-fitted, was towed to Battleship Row to play her historic role. Her guns, .30 calibre up to five inch, functioned; her tower rose 144 feet into the air. Down to the last detail, this film set was a duplicate of *Arizona*.

As *Arizona*, she was attacked and put under fire repeatedly and finally destroyed four days before the end of filming in Hawaii. She also served, for other scenes, as *Nevada* and *West Virginia*.

No less a landmark of that fateful morning was the mast of *Tennessee*, the distinctive gun control tower, always looming in the smoke-framed background of *Arizona*. The "Tennessee mast" was also constructed by Dillingham and erected on Fox-Trot Five dock, Ford Island, in an alignment with *Arizona*. The two unusual and massive structures on the Row's skyline were tourist attractions for several months. Each figured in four weeks of filming.

Pearl Waters—Cameras rolled in Aiea Bay to capture the attack on *USS Helm*, only warship underway at 0755 hours; in the Channel between Ford Island and the Navy Yard to record the vicious attacks on *Nevada* escaping toward open sea; in East Loch to focus on destroyer nests; off the harbor entrance to watch the *USS Ward* depth-charge Japanese midget submarine.

Ford Island had the dubious distinction of receiving the first bomb hit in Pearl Harbor, a single bomb to the seaplane ramp at 0755; seconds later, parts of its PBY hangar hurtled through the air as other bomb hits registered. These scenes were re-created for "TORA! TORA! TORA!" on the exact site in late January. Subsequently, Ford, re-dressed as Hickam (which is completely changed and modernized) became that Army Air Corps base as the Japanese strafed and bombed during the famed incoming flight of Major Truman Landon's B-17 Flying Fortresses.

Wheeler Field—like Ford Island has been de-activated as an Air Force base, and looks almost the same as in 1941. Dressed with lines of P-40 aircraft, Wheeler fell under the attack of strafing

and bombing aircraft in some of the most visually spectacular scenes of the film. It was from Wheeler that Lieutenants Taylor and Welch re-armed their aircraft to slug it out with "Zeros" and "Vals", the only aerial combat of the day. Each were credited with four enemy kills.

Other Locations, Hawaii—Downtown Honolulu; Kahili district, Honolulu; Koko Head, Oahu; Opana Point, Oahu; Navy Fire School, Aiea; Submarine School, Navy Yard; Schofield Barracks, Oahu, Fort Shafter, Oahu; Kolekole Pass and pineapple fields, Oahu; Chinaman's Hat, Oahu; Waikiki Beach, Oahu; RCA Office, Downtown Honolulu; Navy Ferry Landing; Aloha Tower.

Washington, D.C.—Exteriors, The White House; State Department; War Department; Old Navy Building, Japanese Embassy; Admiral Stark's residence; Arlington Farms; Rock Creek Park.

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Beverly Hills, California—Interiors, The White House; Office of the Secretary of State; Japanese Embassy; Secretary of War's Office, General Miles' office; Navy Intelligence Center; Signal Corps' Intelligence; Secretary of Navy's office; Admiral Stark's office; General Marshall's office; Cabinet Room, Berlin; General Marshall's residence, Ft. Myer.

Air Operations

Air operations for "TORA! TORA! TORA!" involved the most extensive use of operable aircraft ever employed in the making of a film and the Fox "air force" totaled more than seventy planes, ranging from types modified for Japanese military aircraft of World War II to Flying Fortresses, P-40's and PBV's.

The re-creation of a Japanese strike force for bombing, strafing and torpedo runs against Pearl Harbor posed a staggering problem. At first, it was hoped that authentic "Zeros," "Vals" and "Kates" could be found. Research and survey moved across the Pacific to the Solomons, the Yap group, and other far-flung islands. Some of these islands were by-passed by the U.S. fast carrier forces, and Japanese aircraft were known to exist on them. Still photographs revealed palm trees growing up through wings; other signs of deterioration.

The Fox survey team found that it would take at least five authentic Japanese aircraft to make one, not counting the need for completely new engines. Further, harbors being non-existent on these islands, or at a distance from the rotting fields of aircraft, it would be

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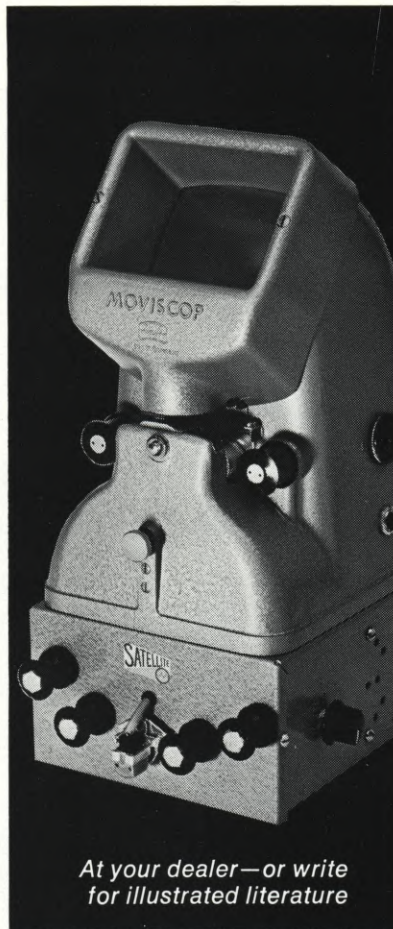
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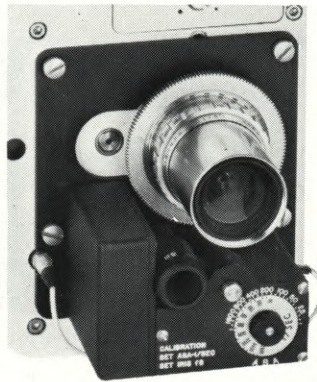


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necessary to lift each air-frame by helicopter and then barge them either to Japan or the United States for rebuilding. The cost would have been prohibitive.

The decision was then made to modify existing air-frames of AT-6 and BT-13 types. Steward-Davis, Inc., and Cal-Volair, both of Long Beach, California, began this work early August, 1968. In Japan, C. Itoh Company similarly modified nineteen AT-6 aircraft, declared surplus by the United States Military Assistance and Advice Group, and made available to 20th Century-Fox.

The AT-6 was modified to duplicate the Japanese Mitsubishi A6M2, type 21; the BT-13 was modified to duplicate the Aichi 99 "Val" dive bomber, and the Nakajima 97 "Kate" torpedo bomber was made from a combination of BT-13 and AT-6 fuselages.

Test flown first in California, the aircraft operated almost continuously from mid-December, 1968 to late April, 1969, burning about 3000 gallons of fuel daily, and were put through combat conditions identical to those of World War II, excepting that Panavision cameras did the shooting rather than anti-aircraft batteries.

The pilots were drawn from both military and civilian walks of life. More than half were off-duty or on-leave pilots from the Navy, Air Force and Marine Corps. Some were pilots on commercial airlines and others were in the charter business. Ages ranged from late twenties to mid-fifties, and some of the "hottest" film pilots were over the half-century mark. Many were combat veterans, and one pilot had been shot down in three wars—World War II, Korea and Vietnam.

For the pilots, it was more fun than work. They could legally "flat-hat" over deserted Ford Island; they were flying formation again, sweeping in "gaggles" over the length of Oahu. It was seat o' the pants flying once more in something other than a fancy jet; open cockpit flying where they could taste it and feel it.

Hawaii also got its first look at Flying Fortresses in more than twenty years. Five of the big birds, on lease from Aviation Specialties Company of Mesa, Arizona, and hired away from their usual duties as insect sprayers and borate bombers, made the long hop from the West Coast to appear as Major Truman Landon's historic in-coming flight at the time of the Japanese attack. They created a sensation in the skies over Oahu, painted again in Army Air Corps olive green.

Two P-40's also drew much attention. As the aircraft of Lieutenants Welch and Taylor, they engaged in dog-fights with Zeros over the pineapple fields near Barbers Point. Other eye-stoppers were the PBY's (Navy flying boats) for Ford Island scenes, and a scouting seaplane on the deck of USS Arizona. Added to these oldtimers was a Stearman bi-plane and a SBD bomber.

In reality, 20th Century-Fox was operating an "air-force," complete with maintenance facilities and a roster of mechanics. A staff of twelve technicians from Aviation Specialties kept the birds in the air. It went far beyond minor repairs. Seven engines were completely replaced, and all engines were overhauled at least once during the filming. The "AvCo" mechanics set a remarkable record in keeping an average of twenty-seven Japanese aircraft in readiness at all times.

"Tora" Briefs

In 1966 and 1967, no one connected with "TORA! TORA! TORA!" fully realized just what would have to be accomplished to make this film a true representation of the historic events. But by film's end in 1969, randomly:

IN JAPAN

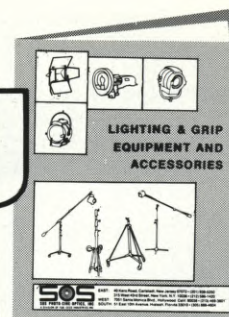
A full-scale battleship had been built, as well as an aircraft carrier; the famed Chigusa Room of the Imperial Palace was constructed in Kyoto; a Shinto Shrine, like the ones Nagumo's pilots prayed before on the *Akagi* and *Soryu*, was set up; even a bas-relief model of Oahu and Pearl Harbor, exact copy of the one Yamamoto displayed to his staff, was plastered together; no one had thought too much about the medals and decorations worn by Yamamoto, but by picture's end, they had become an important part of the production.

IN THE UNITED STATES

Few envisioned the building of a portion of the *Arizona*, or the towering *Tennessee* mast, or the Japanese air armada, or thirty P-40's, or three Japanese midget submarines. No one thought in 1966 about "Purple," the de-coding machine that broke the Japanese diplomatic code. Still highly classified, it nonetheless had to be built and simulate operation. These items of hardware, which became prop numbers, finally ranged from *California* whaleboats to the old radar outfit on which Privates Lockard and Elliott first spotted the Japanese strike force but failed to arouse attention. One movie company logistics expert reckons that the sets and props of "TORA! TORA! TORA!" would probably fill ten football fields. ■

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Continued from Page 155

means that, theoretically, the entire building could be converted into hundreds of individual laboratories of varying size.

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Each seminar room also has a "lazy susan" type revolving stage that enables instructors to switch from one demonstration or equipment display to another with the push of a button. This can be a major time-saver when the equipment being shown might be a half-ton film processor.

The Riverwood facility will be the hub of a proposed series of satellite teaching centers that will extend into all of our marketing areas, training thousands of customers, dealers and company sales and technical people each year. One such center already is in operation at Atlanta, Georgia. The training involves Kodak products ranging from x-ray film processors to Instamatic cameras and sensitized goods. It also includes instruction in the correct use of other manufacturers' products which are commonly used as part of a motion picture system.

Because integrated equipment is being used from start to finish, we fully expect Riverwood to be a fertile ground for development of the programs for motion pictures and the educational markets. We also expect Riverwood to be the headquarters for development of traveling educational programs. In 1971, for example, we plan to take the Basic Newsfilm Workshop on the road to Europe and Latin America.

The primary intent of these courses—and of all MEC courses—is to make our customers more successful users of our products. Kodak has an obligation to not only sell quality products but to provide the knowledge of how to use them most effectively.

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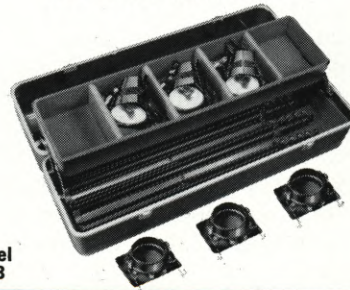
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AERIALS AND STUNTS for "TORA! TORA! TORA!"

Continued from Page 145

The biggest thing you fight in helicopter photography is wind and weather conditions. That's why we had to go out so many mornings in a row to try to get the same shot, hoping that the weather conditions would finally be right.

There was one very tricky shot called for in the script which was a special challenge because it depended exclusively upon the vagaries of the weather. It was so special that unless Nature came up with a rare combination of clouds and sunlight, it would be impossible to achieve without resorting to optical printing or a matte shot.

Historically, when the invading Japanese aircraft approached the Hawaiian Islands, they did so at sunrise. They emerged from a cloud formation and the first thing they saw was the sun casting off rays of halation, so that it looked like the symbol of Japan—the Rising Sun. In order to capture that effect with straight photography we would have to shoot the sun coming up through a cumulus cloud formation shaped in such a way as to throw off *aurora borealis* rays. We thought that we would have to wait months in order to get such a combination of elements, but we were very fortunate. There was one morning when that exact thing happened, and it came out beautifully. Somebody up there must have liked us.

One of the more challenging things we did aurally was working in close with the aircraft during their bombing raids. This is a bit tricky, because when the explosions go off, they change the air currents a lot and you have to be very careful in a helicopter because you can suddenly find yourself in the drink.

One of the most exciting sequences—both David and I were very pleased with it—was the dogfight, for which all of the point-of-view shots were filmed from the helicopter. Much of the credit for its excellence must go to our pilot, Dave Jones. He's really an exceptional pilot, with a great knowledge of the camera—which is what it actually takes in order to be a good helicopter pilot for filming. We were chasing P-40's, which can fly at about 180 miles an hour in the dogfight formation, and Dave had that helicopter doing everything that it possibly could to simulate the kinds of banks that a plane could make. A helicopter is quite limited in that area, but the sequence turned out successfully and it looks very good in the picture.

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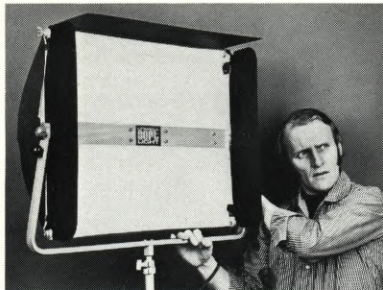


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copter, our camera was a Panavision-adapted Mitchell Mark II, with a zoom lens. I did some air-to-air filming with a specially adapted Arriflex that had Panavision lenses. The only real modification we made was to lighten the equipment as much as possible. It was a very tight squeeze working in those Japanese planes (I don't know how their pilots could get into them), and we had to shoot with cameras that were stripped down to a bare minimum.

Since we had only 40 aircraft, and the Japanese had used 300 in their actual raid, we used longer focal-length lenses to make it appear that there were more planes than were actually there. It was the producer's idea to make the picture feel as much like a documentary as possible, so when we got down to the explosion work and ship-to-ship photography and some of the stunt shots, we used very long lenses quite a lot. There was also quite a bit of hand-held work on the ships and this resulted in somewhat of a *cinema verité* style of photography.

Originally, when we first went to Hawaii, our work was supposed to be confined to the aerials. But after working with Ray Kellogg, the Second Unit Director, for a couple of weeks, he decided that he wanted me to do some stunt photography for him—explosions and fire sequences and that sort of thing. He had rigged a shot in which a stuntman was to be blown off the bridge of a ship and into the water, with the oil on the water bursting into flames as he hit. Shooting that scene required that a cameraman be strapped to the side of the destroyer with flames shooting up around him. The First Unit Operator didn't want to shoot it, so Kellogg called me over and my break into the First Unit was to be strapped onto the battleship with a camera in my hand and lots of flame swirling around. After that I remained with him the whole time, doing stunt work for him.

Ray had thought up some really exciting stunts. He had the stuntmen lined up to do a lot of spectacular fire scenes and high-fall shots, but some of the best of these never got off the ground. It's unfortunate that he wasn't allowed to do some of the more dramatic stunts that we had planned to do, because so much time had gone into the planning. I don't know whose decision it was to cut them out or exactly why it was done, but I was told that it was because they didn't want to show quite that much violence. That strikes me as ironical, because that's what the Pearl Harbor attack was all about—the destruction of the Pacific Fleet and its

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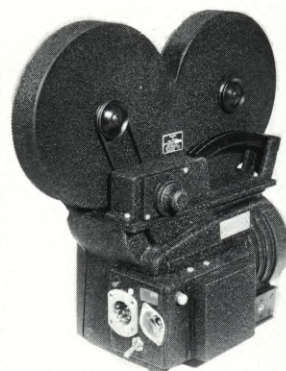
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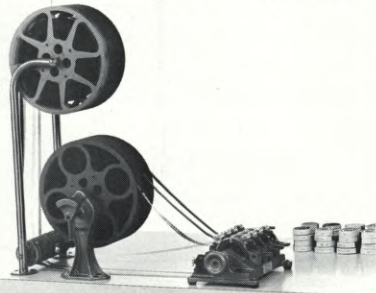
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men—which was horrifying.

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Elmo Williams looked at the footage and decided to write the sequence into the picture—so, naturally, we had to re-stage the problem in order to shoot some intercuts. Ray Kellogg decided late at night, as he usually did, that he wanted a scene in which a B-17 with a crippled landing-gear comes out of the clouds with fire and smoke belching out of it. The plane approaches the field, hits the runway and *bounces over the camera*.

That would have been fine, if they had used a remotely-controlled lock-down camera. But Kellogg said to me, "Do you think you can stay there with the camera and pan with the plane as it bounces over your head?"

Crazy kid that I am, I said, "Sure—okay!"

He stood there and looked at me and he said, "Look, I'll hold onto the seat of your pants and if we get into trouble, I'll let you know."

I kind of laughed and said, "Sure, by the time you pull the seat of my pants, it'll be too late."

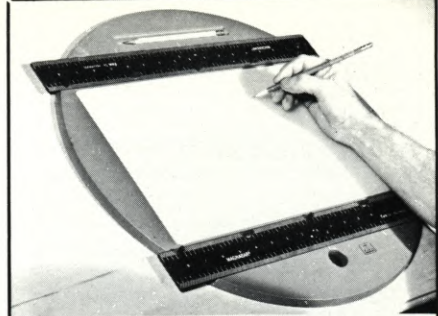
I'm not sure that I'd ever do anything like that again—I don't *think* I would. But the enthusiasm was so terrific at the time. I have great respect for Ray and liked him very much, and he liked me. So, when he said "C'mon, kid—we'll do it," I said "Okay"—and everybody looked at me as though I was crazy—which I probably was.

Actually, my life was in the hands of the pilot who was flying the B-17, but he didn't expect to see me out there—he expected a tied-down camera all by itself. He had to come in on one wheel—which is what they call a "Crash-Landing Procedure"—and then bounce the plane precisely over my head without chopping me up with his prop blades.

Kellogg stayed right with me, holding onto the seat of my pants, just as he said he would—and we got the shot.

I can tell you that there's nothing more exciting than looking through a reflex camera at a B-17 that's coming straight at you and bouncing over your head.

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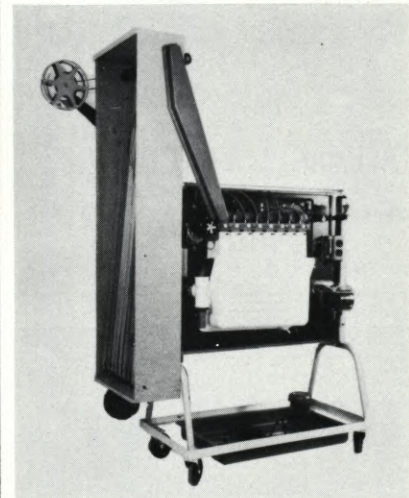
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"LIGHTING THE NIGHT"

Continued from Page 149

him hold the light head as though it were a flashlight. Not only did this provide ample lighting of the subject, but it allowed the film to reproduce the best color possible.

A Frezzo light also was used to simulate automobile headlights sweeping across a yard during the opening sequence with two women returning home at night. This let us pick up good highlights on a prowler hiding in shrubbery beside the house.

Most interior shots were photographed with our Arriflex camera. Equipped with a 400-foot magazine and a 9.5-to-95mm zoom, the camera provided ample versatility and lens speed for controlled-light scenes. The impact of this footage, especially a close-up of a black cat, helped to build the "bad darkness" vis-a-vis "safe light" mood of the film.

Written into the script as a representative of night, the cat was shot in the apartment of Robert Rogers on tungsten film, with two 650-watt photo-floods, and at an aperture setting of F/4.5. To hold the cat's attention, and to keep it looking into the camera, we used a piece of tinsel beside the lens.

In the processed film the effect was actually frightening. The yellow in the cat's eyes was brilliant. The black fur on the face and shoulders was glossy, with slight highlights appearing as the animal moved. In the context of the film, the cat appears on the screen at the end of the transition where we had panned from poorly lighted homes and buildings into blackness.

Even though we screened each day's production daily, no attempt was made to edit the film until the final footage was processed. Then, we edited out those portions of the film that we knew would not be used. The remaining footage was sent to Capital Film Labs in Washington, D.C., for a work-print. Because of low-light shooting conditions, more film was shot than we would have needed under normal work conditions. Our first editing, therefore, was both an economy measure and a time-saving device.

Moreover, we economized by utilizing company personnel, realtors, and local citizens as actors. In several instances, for example, we approached people on the street, explained what we were doing and obtained their assistance. An elderly woman and young boy were filmed in this way at dusk entering their home with a load of packages.

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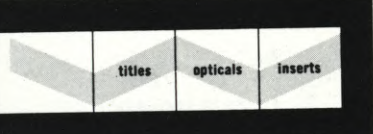
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Store owners were very cooperative, and we used the homes of several realtors for staged sequences inside and out. Except where planned activity was needed, we simply shot areas or buildings that fitted our script.

Near the beginning of our nocturnal shooting, we located one home that was beautifully lighted—almost a perfect example of the lighting promoted in the "Light the Night" campaign. Since we didn't want to trespass, we shot the home, and most of the other houses, from the street, using the Bolex equipped with the 25mm lens. Later we discovered that we had wonderful footage of the county sheriff's well-illuminated home.

One of the primary reasons for using amateur talent, even in the lip-sync scenes, was the same reason we used Ektachrome EF films—realism. The film was intended almost as a documentary. We took this approach to the extent that no titling was used in the beginning of the film. Credits were limited to the end of the movie, although at one point we did show a meeting of the Charlotte Board of Realtors and posters and printed materials for the "Light the Night" campaign.

The composite sound mix was done in our own audio facility from four tracks—narration, music, lip-sync, and background sounds. In one film sequence, individual shots were cut to the beat of the music from a marked 16-mag track.

Currently, some 25 prints have been made. The film has received extensive exposure in Charlotte, through time made available on WBTV television, the other three commercial stations, and the educational channels. In addition, some 90 bookings for the film were made during the first six months for the Charlotte area, and at least two showings have been made to national realtor groups. Other realtor organizations around the nation are either asking for loan copies of the film or have purchased a print.

In Charlotte, the reactions to the film in its promotion of the "Light the Night" campaign are considered significant. There have been a number of requests for the film to be re-shown and a flood of requests to the local power company for installations of home and yard lighting.

But most interesting and satisfying to us has been the steady volume of telephone calls received by the Board of Realtors office for assistance and information relating to proper lighting. One of the closing suggestions in the film was that the audience do just that. ■

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Continued from Page 104

theatrical film, "THE AGONY AND THE ECSTASY", won several awards, including the Golden David by Donatello, the Silver Ribbon and the Michelangelo Prize. He also has served as head of Italian film production for 20th Century-Fox Film Corp.

A Technicolor motion picture film processing subsidiary, Technicolor S.p.A., is also headquartered in Rome. Other Technicolor subsidiaries in Europe are Technicolor Ltd., London, a motion picture film processor, and Technicolor Fotografica, S.A., Barcelona, a consumer photo finisher.

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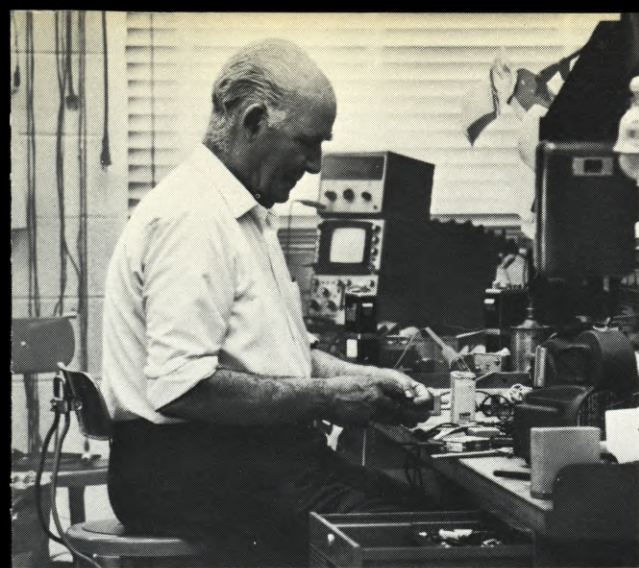
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