
UNIVERSAL STUDIO'S
Hindenburg

The German Hindenburg was the largest and the last of the giant lighter-than-air ships that carried passengers across the Atlantic in unvelievable luxury. This chapter in the history of flight came to an end, on May 6, 1937, at Lakehurst, New Jersey, in one of aviations worst disasters. This Fall you will see Universal Studios movie, ''Hindenburg,' starring Anne Bancroft and George C. Scott. This exclusive RCM article, by Dick Burkhalter will take you behind the scenes at Universal Studios for an inside look at one of the most remarkable and ambitious radio control projects in modern cinematography.

It is a well known fact that models have played a large part in the business of movie-making. Since the earliest days of motion pictures, miniatures of all types have been used in place of their full size counterparts. Models offer many advantages in terms of costs, controlability, availability and sometimes expendability.

The use of radio control, somewhat slow in catching on, is becomming more prevalent as movie producers are made aware of the immense capabilities and relatively low cost of these miniaturized guidance systems. A fairly recent example featured on these pages was the R/C seagull built by Mark Smith for the movie ''Johnathan Livingston Seagull.'' Not quite so well publicized have been the use of radio control models and devices in other feature films and series episodes for television. But by far the most ambitious project to date, as far as R/C modeling is concerned, is the scale Hindenburg airship constructed at Universal Studios for the movie ''Hindenburg,'' starring George C. Scott and Anne Bancroft, to be released this Fall.

For readers not familiar with the story of the original Hindenburg, a little background information is in order. The Hindenburg was the last and the largest in a line of lighter than air craft built in Germany in the years preceeding World War II. In those days, prior to the development of high altitude, long range airplanes, airships like the Hindenburg and Graff Zepplin presented an attractive alternative to ocean liners. Taking only two days for an ocean crossing, as opposed to the Queen Mary's six day trip, airships saved time while offering their passengers luxury equal to the big ocean liners. The Hindenberg carried 97 passengers, and the smaller Graff Zepplin carried 62. Both offered spacious cabins, elegant dining rooms and entertainment in their lounges, and both made numerous flights from Germany to the United States and South America.

This chapter in the history of flight was brought to a close forever on the evening of May 6, 1937, when the Hindenburg was destroyed by fire while attempting a landing at Lakehurst, New Jersey at the end of a stormy ocean crossing. Thirty-five of the 97 passengers aboard were killed in the crash; many others were severly burned and disfigured for life.The cause of the fire has never been determined, but the Graff Zeplin was immediately taken out of service and a new airship, the LZ-130, then under construction, was completed.

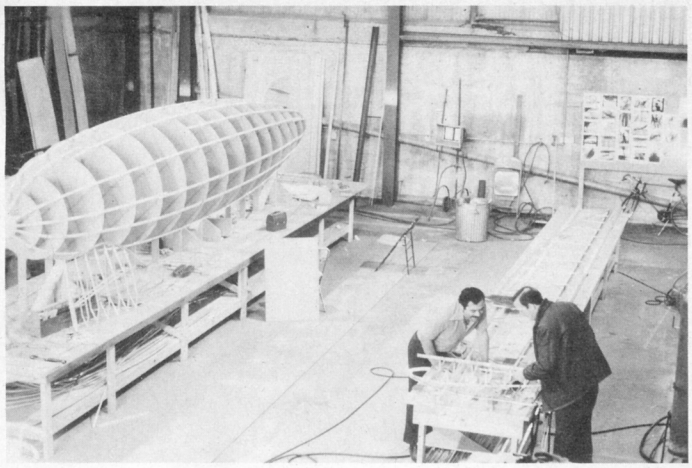
The creation of the scale model Hindenburg began nearly two years ago, when the decision was made to produce the movie. A model would have to be built, since there are no dirigibles left in the world. Art Director Ed Carfagno and Unit Manager Ernie Wehmeyer were sent to Germany to gather information and background material. While this trip was successful from the standpoint of providing data on costumes and settings for the period, little was found which would aid in the building of the model. A few photographs and some small drawings were all they could produce. Additional documentation was unearthed by the studio's Research Department during the project, however, and the finished product must be considered as accurate as humanly possible to achieve. The accuracy is attested to by no less an authority than the Smithsonian Institution, which has asked to acquire the model and full scale pilot's gondola for inclusion in their permanent collection. As of this writing, it is expected that the request will be granted. (Other full size portions of the Hindenburg constructed at Universal include a portion of the nose section, 70 feet high and 60 feet long, a portion of the center underbelly 45 feet high and 150 feet long, a portion of the rear fuselage and lower rudder, and a mockup of the passenger lounge which was mounted on a 60 ton gimbal that could be tilted nearly 30 degrees in any direction. These were all destroyed in filming the fire and crash scenes.)

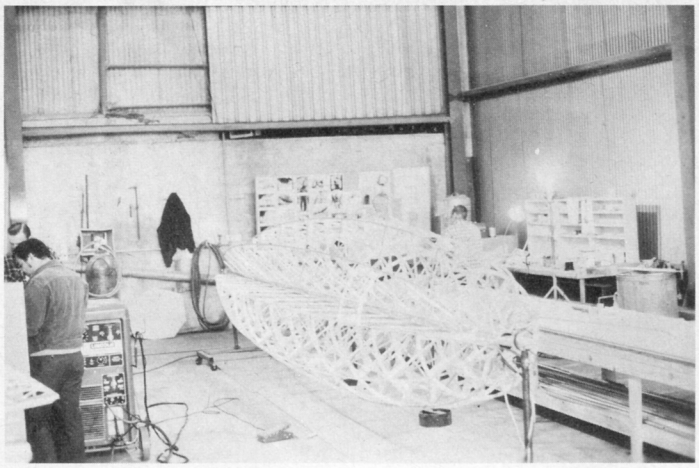
The Special Effects team charged with construction of the model, headed by Bob Beck and Walt Lapwood, began construction of the 3/8'' scale model on April 4, 1974. Their first step was to build a wood mockup of the fuselage on a table of 3/4'' Structo Board. This mockup consisted of circular bulkheads of 1/4'' plywood spaced 18'' apart, connected by stringers of 1/8'' by 1'' pine. The only documentation available at this time were a few photos and a small three-view drawing which, to any dedicated scale modeler, would be considered crude. The mockup was checked and adjusted against the photos until the shape of the fuselage was ''eyeball'' perfect. At this time, the shape and location of the various details such as the engine nacelles and pilot's gondola were determined. Wood forms for these parts were built, to be used for shaping of the final aluminum parts. This stage of the job was completed in about three weeks.

Once the shape of the mockup was approved, construction of the actual model was begun. A twenty-five foot length of four inch diameter aluminum tubing was used as a ''spine'', to which the framework was attached. Contrary to usual modeling practices, which would have been to build circular bulkheads and tie them together with stringers, the Hindenburg was built in a longitudinal manner. That is, a jig was built to facilitate construction of nine identical ''half-profiles'', which were welded to the central spine at 40 degree intervals. These half-profiles were built of aluminum angle and strip stock and resemble a bridge truss with one straight side (which attaches to the spine) and one curved side (which forms the outer contour of the model). As each of the half-profiles were completed, they were welded to the spine, and pie-shaped bullhead sections were welded in place to tie the structure together. When the basic framework was complete, additional stringers were welded on at ten degree intervals to finish the outline. During all construction, the model was supported on pedestals attached at the front and rear of the spine, somewhat like a giant RCM Painting Jig. This allowed the model to be rotated around its axis so the work could always be conveniently placed.

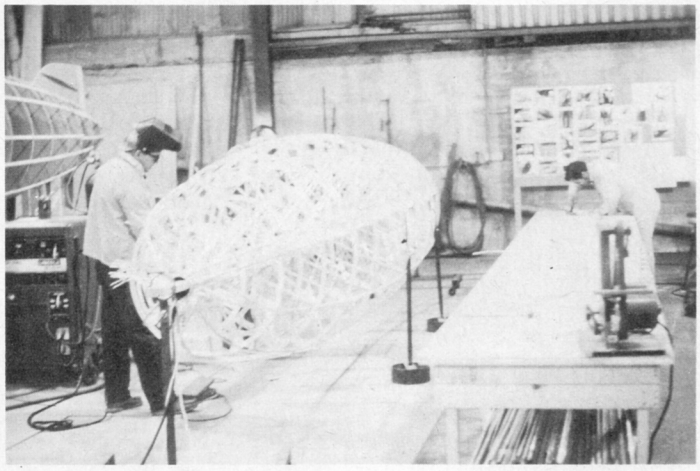
At the same time that the fuselage was being built, other craftsmen were assembling the rudders, elevators and details such as the pilot's gondola and engine nacelles. These were temporarily mounted in place to check for fit as they were completed. The installation of the radio gear and the various mechanical bits and pieces were made as each of these sub-assemblies was completed.

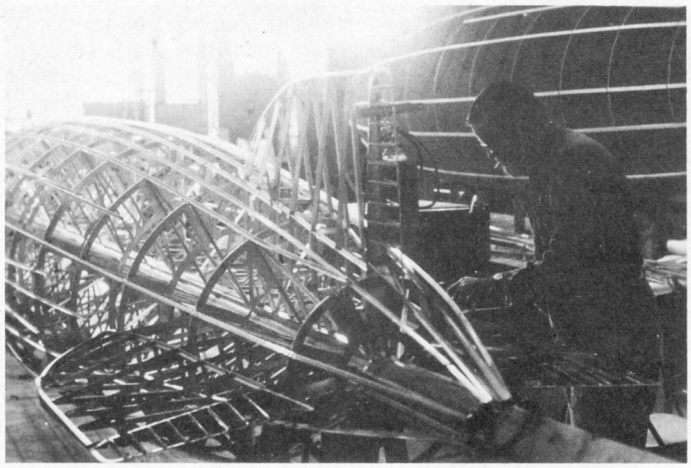
The covering material for the Hindenburg was by another product well known to RC'ers, Super Coverite. Three twenty-five foot rolls and numerous single sheets of this material were used. The Coverite was applied in the usual manner with sealing irons and heat guns. Many inspection hatches and doors for access to the internal

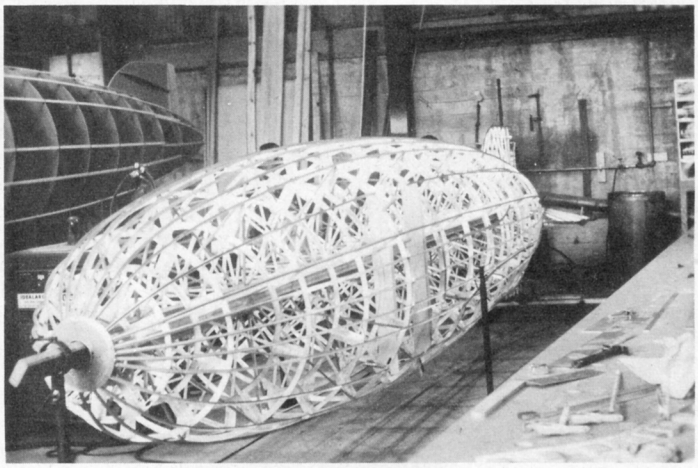


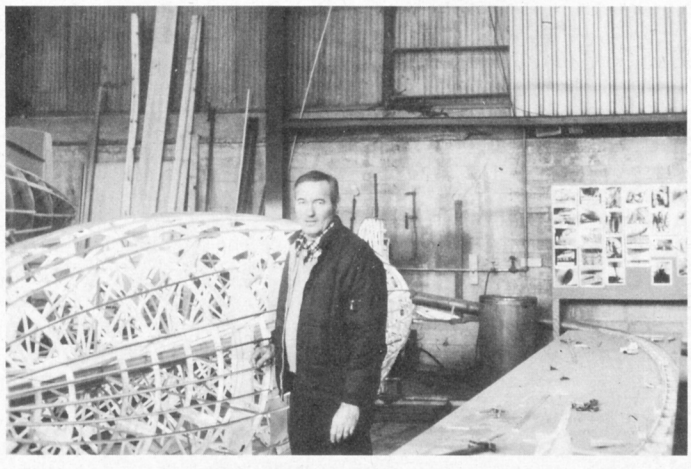


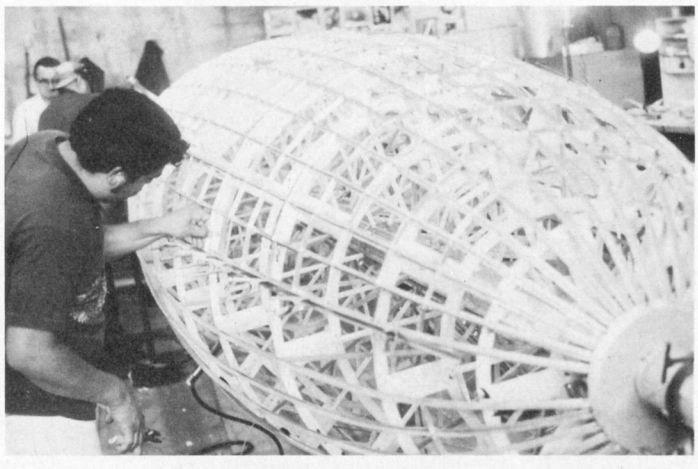
ABOVE, LEFT: Beginning of miniature construction, wood mock-up at left of photo, first half-profile on table. ABOVE, RIGHT: All half-profiles welded in place on central spine. Filling in of bulkheads still incomplete. RIGHT: Completed basic fuselage skeleton, less tail and fill-in stringers. BELOW, LEFT: Rudders and elevators welded in place. BELOW, RIGHT: Complete fuselage with tail in place. BOTTOM ROW, LEFT: Bob Beck with Hindenburg skeleton. Photos on rear wall comprise total documentation available at this stage of construction. RIGHT: Adding fill-in stringers.

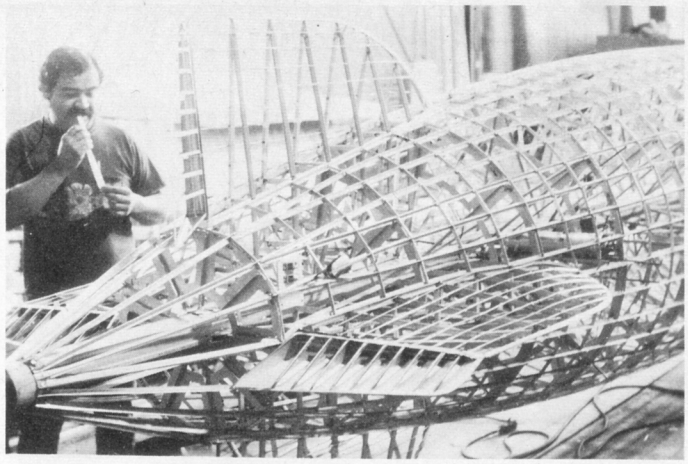


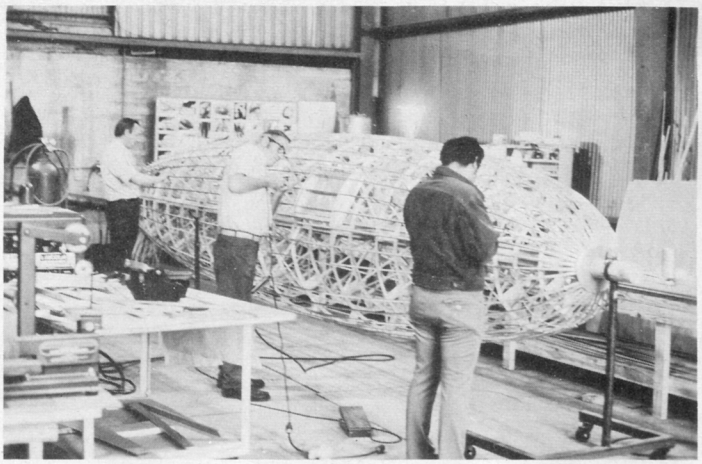


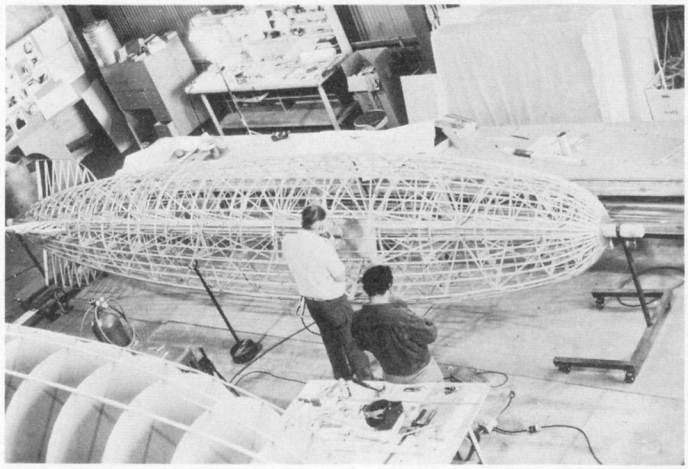


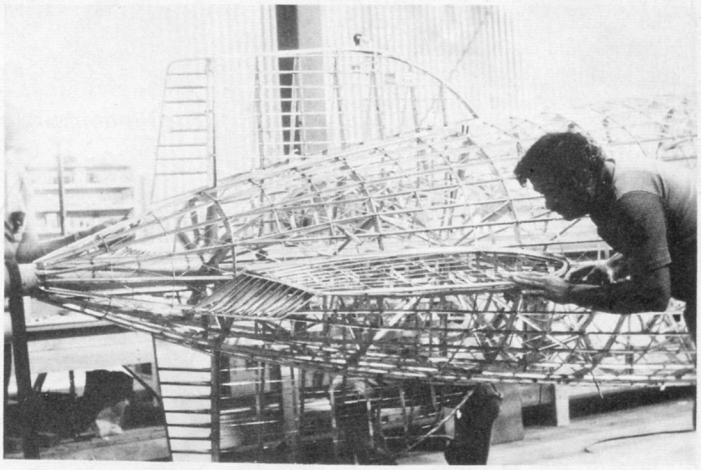


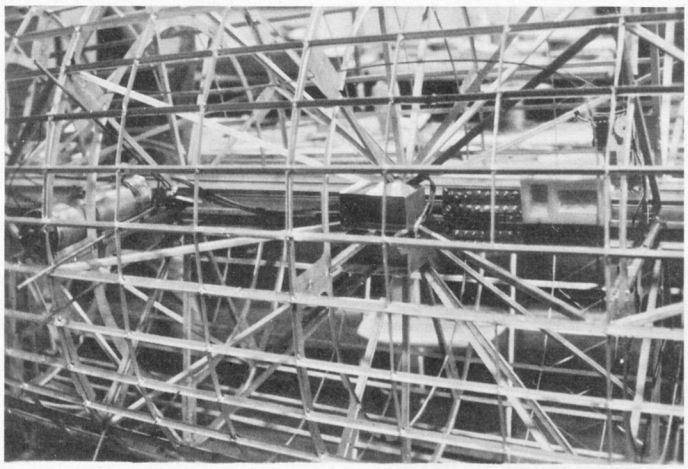


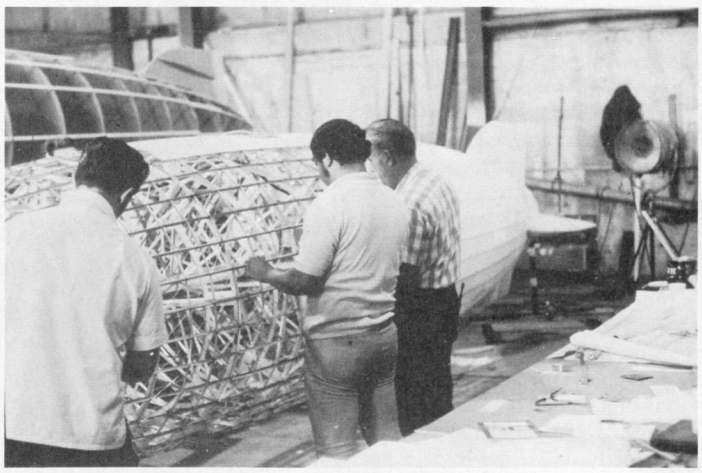


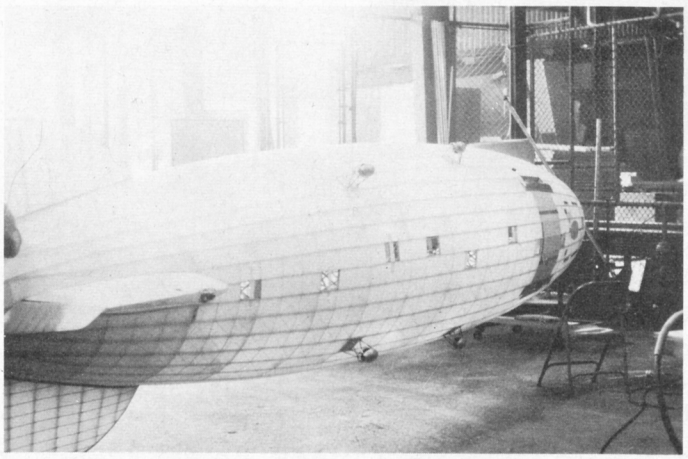












TOP ROW, LEFT: Detail being added to rear fuselage and tail section. TOP ROW, RIGHT: Fitting details – passenger lounge, engine nacelle mounts, access hatches. SECOND ROW, LEFT: Overhead view of fuselage framework. SECOND ROW, RIGHT: Finishing around the tail section prior to covering. ABOVE, LEFT: Interior close-up showing wire exterior X-bracing. ABOVE, RIGHT: Beginning the application of Coverite to the Hindenburg framework. LEFT: Covering complete, engine nacelles in place. This is bottom of ship – dark spot at front is location of passenger lounge.

workings of the model were individually covered. These all had to fit well, with no visible gaps that would mar the close-up photography.

The finish was rather unusual, and merits some discussion, as the techniques could be copied to advantage by interested scale modelers. It began with the application of three coats of Aero-Gloss clear over the bare Coverite. Following this, aluminum powder was applied to the dry doped surface by rubbing with cotton pads dipped in the powder. When the entire model had been burnished in this manner, it was sealed with four more coats of clear. Selected areas were then masked off and given additional burnishing, this time with lamp-black added to the aluminum powder to darken it. These areas were resealed with more clear dope. The resulting finish simulates the aging, repairing and recovering of various parts of the airship. Though weight was not of importance on the Hindenburg, I suspect that this technique would result in a lighter finish than using silver dope throughout. For those interested in experimenting with the technique, the aluminum powder is called Cres-Lite and is manufactured by Crescent Bronze Powder Company. It should be available in any well-stocked automotive paint store.

Selection of the radio equipment was made early in the project. Initial specifications for operating features determined that up to 30 channels of operation would be required. A detailed comparison of the major brands of R/C equipment was made, with particular emphasis being placed on those factors significant to the project. Some of these were:

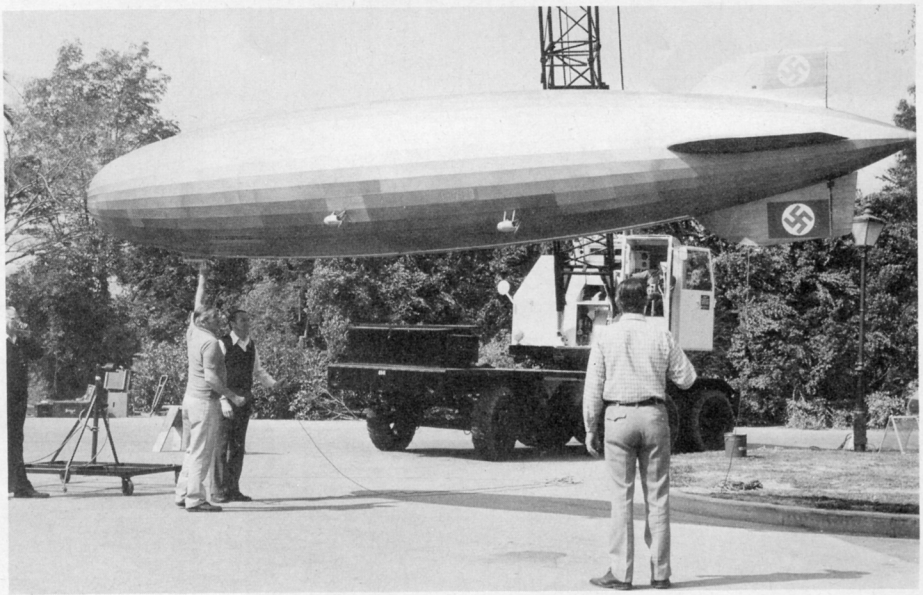
Servo Performance — Plenty of power would be required to move the heavy rudders and elevators of the model, and for these functions, smoothness and precise centering would also be necessary, as the closeup photography would accentuate any jumpiness or "hunting" of the surfaces. For other functions, such as the dumping of water ballast, servo speed was considered of prime importance.

Temperature Stability —Because the airship would be left on unheated sound stages overnight and be expected to perform perfectly under the intense heat generated by the movie lighting, the ability to perform reliably at all temperatures was a major consideration.

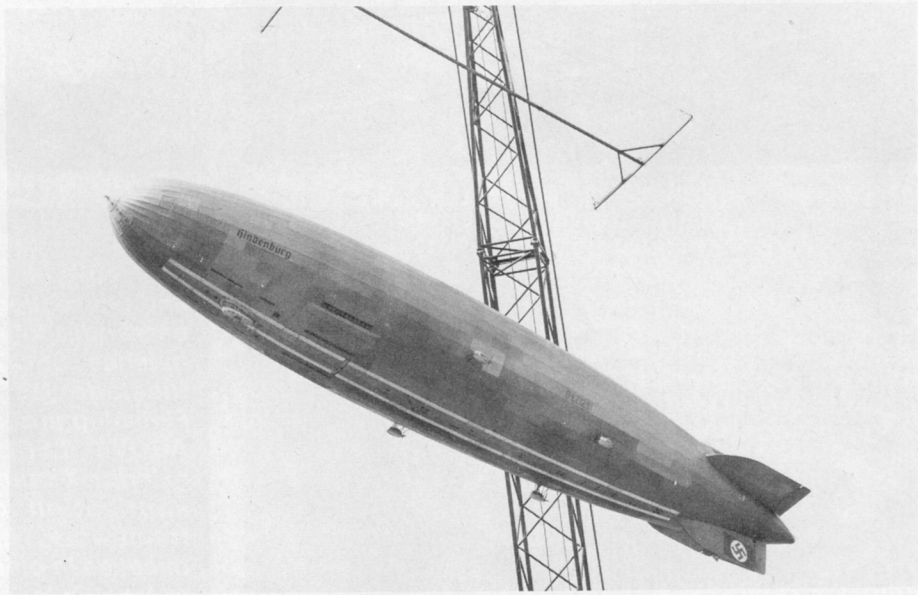
Interference Rejection —The framework of the model is metal and a studio sound stage is a veritable rat's nest of electrical wiring. Therefore, it was important that the systems chosen be able to reject any stray signals and be oblivious to externally generated noise. With multiple transmitters operating simultaneously, it was also important that the R/C systems themselves didn't shoot each other down.

Cost and Availability — While it would be a mistake to jeopardize the success of a multi-million dollar film by attempting to skimp on the cost of relatively inexpensive R/C equipment, movie studios, like any

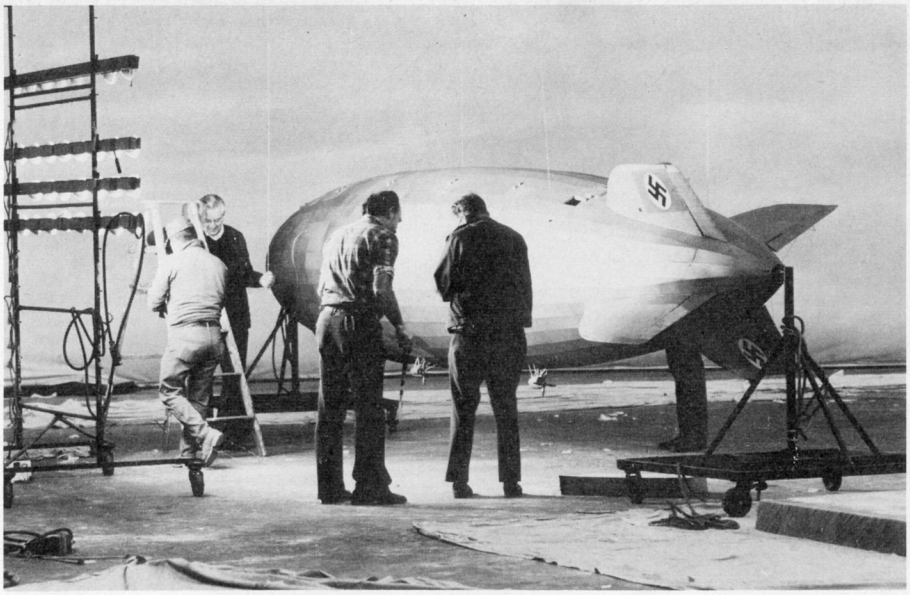
The Hindenburg on outdoor location.



The 300 lb. dirigible about to be crane hoisted.



The large crain hoists the model high overhead.



Studio workers prepare to hang the Hindenburg on Stage 12.

Painter, Sam Pritchard, coats support wires with dulling lacquer to render them invisible to the camera.

other successful businesses, must operate within a budget. Many, if not all, of the currently available radio systems meet the performance standards, but the systems chosen represent, to the studio, the best possible price/performance ratio. Availability comes into play in that radio system delivery and maintenance could not be allowed to delay production schedules.

When all of the above factors were taken into consideration and weighed carefully, the decision was made to purchase five Futaba Digital R/C systems; three six-channel and two five-channel, for a total of 28 functions. These were purchased through Reginald Denny's Hobby Shop in Hollywood, who not only delivered the original systems quickly, but also offered a plentiful supply of spare parts and could handle any service required.

As soon as the radios were on hand at the studio, design, construction and testing of the R/C functions was begun. Systems were constructed for the various operating features and tested in mockup form. Four Dumas-Pittman 12V boat motors were selected to simulate the airship's 1200 HP diesel engines, propellers for these being cut down and reshaped from regular Top Flite stock wood props. Experiments with commercially available speed controllers were not too successful, so more elaborate set-ups were made. These consist of variable rheostats driven off roller cams mounted directly to the servo output shafts. Water ballast dumps were rigged using compressed air bottles to maintain an even pressure of 10 psi regardless of tank level. The raising and lowering of the passenger and cargo doors and boarding ramps was accomplished via cable and drum arrangement triggered by servo motion, with micro-switches used to limit the travel at both extremes. A similar technique was used to retract and extend the three scale radio antennae and the fore and aft mooring lines.

The most complex of the scale funcitons was the control of the interior and exterior lighting of the Hindenburg; these functions alone occupy nine channels of operation. All lighting on the model is adjustable via servo-controlled rheostats. Individual lighting circuits can be activated separately or together, and a full range of brilliance, from the dimmest glow to full 24 volt power, is possible in each circuit. There are running lights on the top and bottom rudders and landing spotlights fore and aft on the belly of the ship. Inside, there are lights in the extreme nose, in the pilot's gondola, the passenger lounges and staterooms, and in the cargo compartments which run the full length of the ship. Two twelve volt automobile batteries inside the model provide the power for the lighting and the other electric motors required.

The Hindenburg ''flies'' on the sound stage via a unique system of wires and cables, all controlled via R/C. The model, itself, is suspended from a rectangular steel frame by four twenty foot lengths of 3/16'' piano wire. This piano wire is treated with a

coating which kills any reflections and makes it invisible under the studio lighting. (And not just to the camera, but the naked eye as well from a distance of fifteen to twenty feet!) As the suspending frame is well above the model, it is always out of camera range. The frame is, in turn, hung from a track mounted on the stage ceiling by four lengths of 1/2'' stranded steel cable. These cables are wound on drums powered by electric winch motors. Fore and aft winches are separately controlable so that the model may be tilted as well as raised and lowered. Forward and backward motion is possible through motors which propel the entire framework, winches and all, along the track. Two tracks were built on the stage. The first is a straight section, 180 feet long; the second is an S-curve and is over 200 feet in length. During filming, various backdrops are placed behind the model, and clouds or fog, if desired, are created. Three to six radio operators are necessary to control the Hindenburg, depending on the complexity of the shot.

No project of this magnitude is accomplished without problems, of course, but fortunately, construction and operation of the Hindenburg has been free of any major snarls. A few minor bugs crept in, however, and here are some examples:

The original photos of the Hindenburg indicated that the engine nacelles were of all metal construction. Later photos turned up by the Research Department showed that the upper rear portions of these were fabric over metal frameword. The original miniature nacelles were modified by cutting away these portions and substituting vacuum-formed plastic covers which were painted to simulate the fabric.

The Coverite was found to sag and wrinkle overnight due to the great change in termperature in the stage. This was easily remedied by application of localized heat with irons and heat guns. Some of the wrinkles were purposely left in at the Art Director's insistance, as they lend an air of realism to the miniature!

Servo chatter and dithering was noticed on the rudder and elevators when the first tests were made with all four engines running at full speed. This was traced to electrical noise originating from the ball bearings used to support the propeller shafts. Substitution of the bearings with non-metallic bushings quickly cured that problem.

The rudders and elevators were observed to ''bounce'' when control movement was started and stopped. The first thought was that the pushrods were flexing, but inspection showed that they were plenty stiff. The inertia of the moving surfaces was great enough to move the entire servo mount and surrounding framework! The cure was to wrap rubber bands around the rudder and elevator pivot tubes and anchor the bands to some nearby framework. This put just enough drag on the surfaces to stop the excess motion, and the strong servos were able to overcome the drag with ease.

It should be noted that with the exception

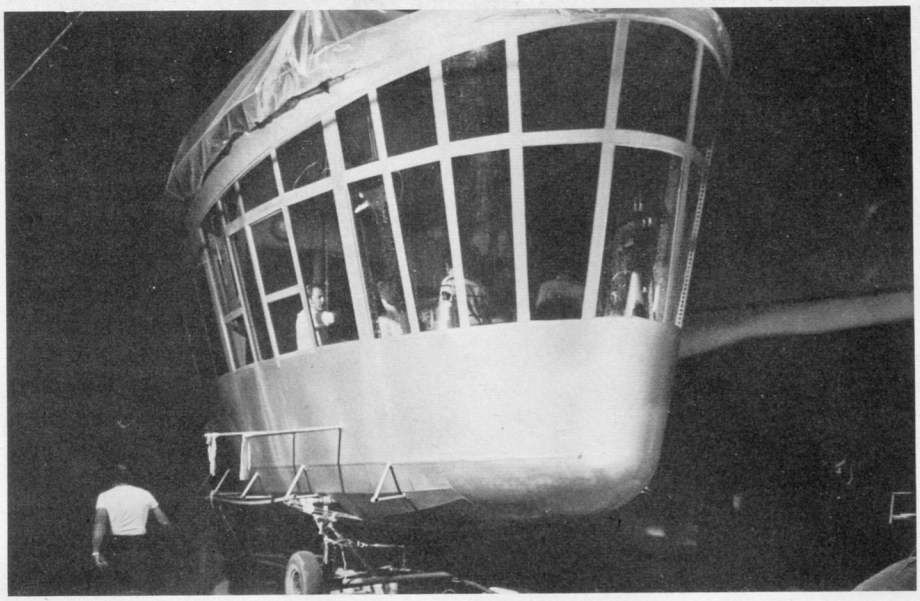
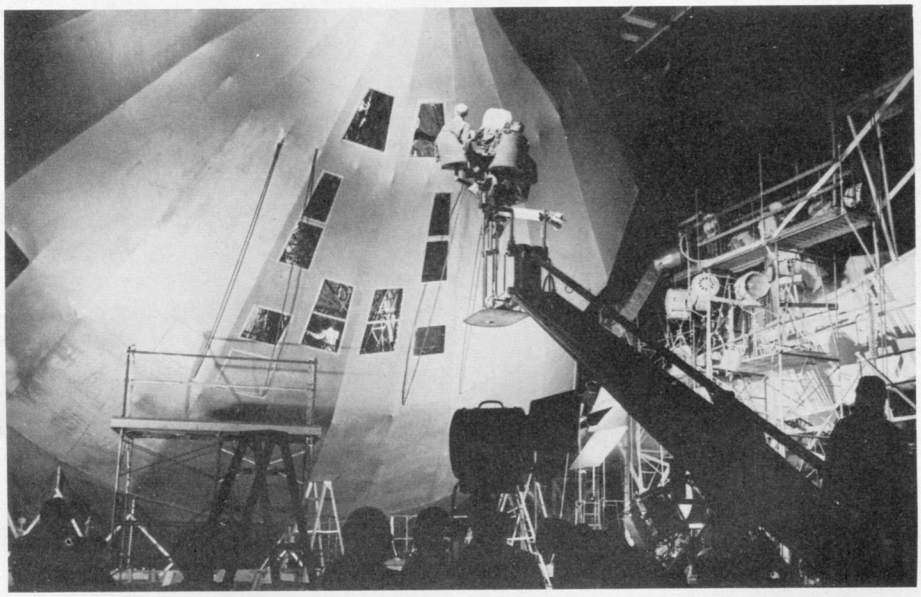
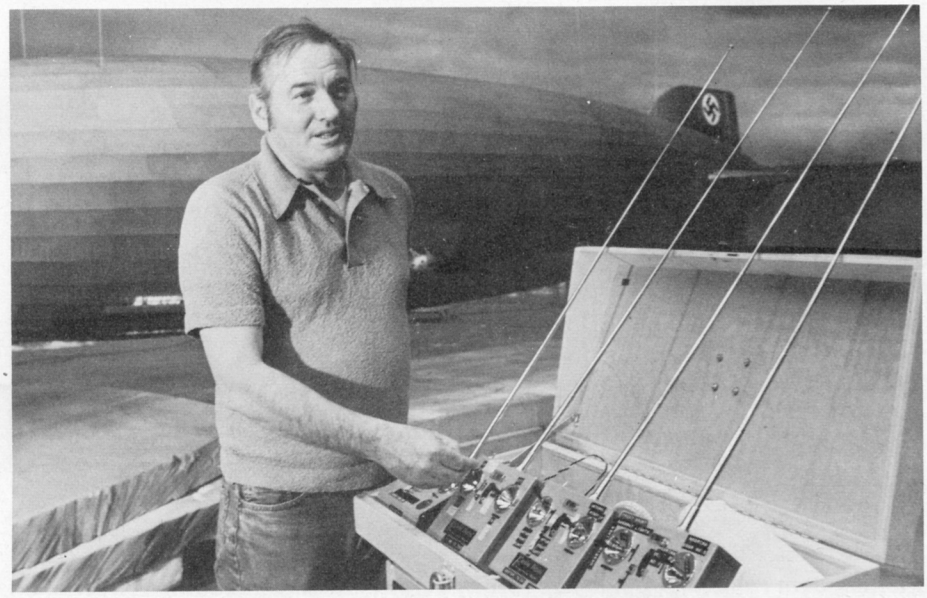


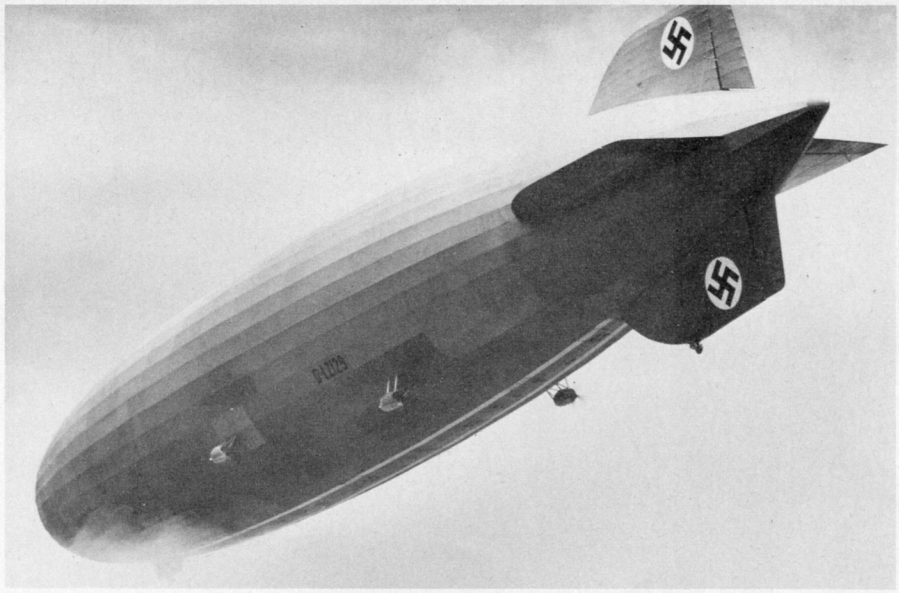
Photo of full-size pilot's gondola.



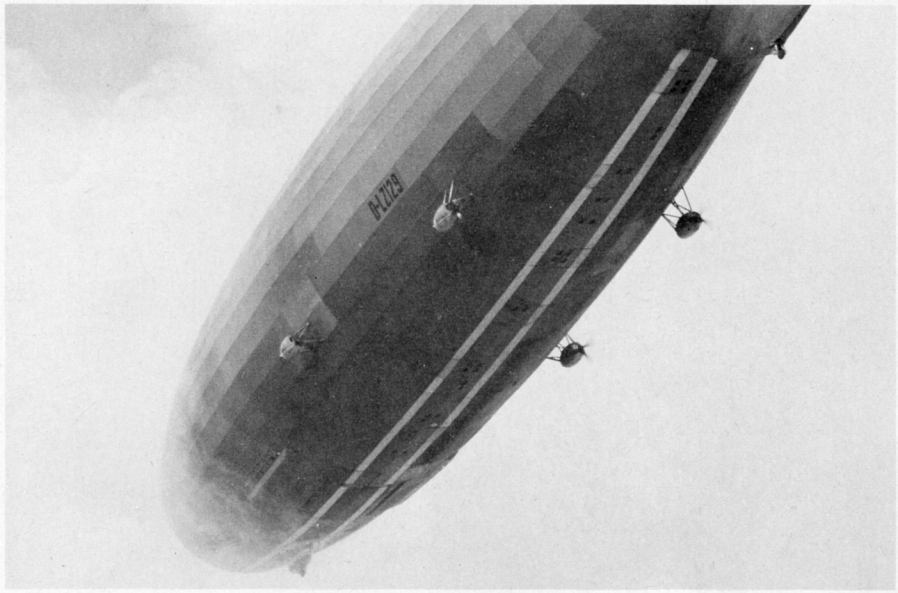
Setting up a shot of the full-size nose sections.



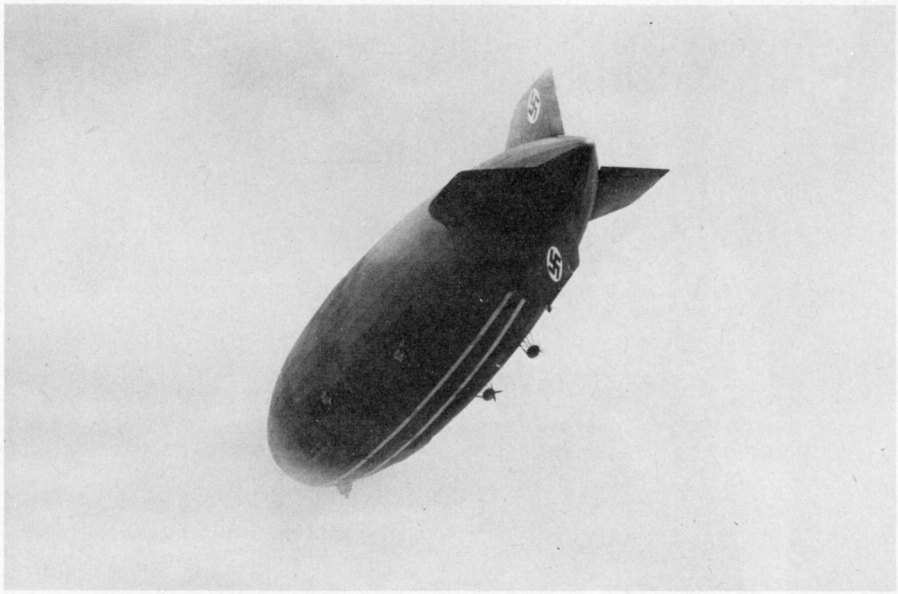
Bob Bell demonstrating 4 of the 5 Futaba R/C systems used on the Hindenburg.



The R/C Hindenburg passing overhead.



The Hindenburg entering a soundstage 'cloud.'



Hindenburg flies through cloud with only two rear engines operating.

of the single incident involving the prop bearings, the R/C systems performed perfectly throughout the project. No parts replacement, nor repairs of any kind were required at any time.

I was fortunate enough to have been on stage during some of the early test filming of the model, and was treated to a scene that some now-forgotten escort pilot may have witnessed nearly forty years ago over the North Atlantic. The stage was filled with artificial clouds from the floor to about eye-level, and a dark sky backdrop was in place about 30 feet behind the model. Somewhere in the murk, the Hindenburg rested on the floor, waiting for its turn to perform, while the lighting technicians, cameraman and crew fussed and fiddled around readying for the scene. At the Director's command of "Action," all became silent except for the gentle whirring of the electric motors.

Slowly the dark shape of the Hindenburg became evident, rising slowly through the clouds, its form outlined by the softly diffused glow of its running lights. As the giant airship neared the top of the cloud, more detail could be perceived, the lights in the passenger staterooms and lounge giving dimension to what was just moments before a vague silhouette. The nose broke through the cloud first, followed shortly by the whale-like fuselage and finally, by the upper rudder emblazoned with the brilliant red, white and black flag of the Third Reich.

The Hindenburg leveled off, its four propellers leaving swirls of mist in their wake, and continued across the horizon just above the clouds, its shimmering silver skin bathed in the light of the full moon.

"Cut and print it!" from the Director's bullhorn jarred me back to the present, and I stood for a moment, shrugging off the chill that had run up and down my spine. Then I chuckled to myself and walked out of the stage. I had stood there, no more than twenty feet away from the model I had watched take shape almost from the first crude sketch and my mind had totally accepted, if only for a moment, that the scene I had witnessed was **true**! This was the ultimate Scale modeler's fantasy!

When the movie "Hindenburg" is released in your area, I urge you to go out and see it, and join me in congratulating the Special Effects team at Universal on a magnificient job.

TECHNICAL DATA — R/C HINDENBURG

Length	25' 3"
Diameter	4' 2"
Weight	300 lbs.
Radio Type	Futaba Digital

RADIO CONTROLLED FUNCTIONS

Channels	Function
1	Rudders
1	Elevators
4	Engine Control
1	Passenger Doors/Boarding Ramps
2	Water Ballast (front and rear)
2	Mooring Lines (front and rear)
1	Radio Antennae
3	Freight Compartment Doors
4	Track Traverse and Tilt
9	Interior and Exterior Lighting □