

The Real R2D2

Here's the inside story on the real (?) R2D2 built by mechanical wizard John Stears.

TWO VERSIONS of R2-D2 were made, one for Kenny Baker to fit inside and the three-legged radio controlled version. Our interest is centred on the radio controlled version.

R2 D2 has three forward speeds, but no reverse, and is steerable. Provision is made for the change from two legs to three legs by radio control, also when tilted the third leg drops automatically. The reason for this is that R2 would fall over if left on only two legs.

MECHANICAL

In order to achieve forward motion, the two rear legs have individual traction motors which drive twin inline wheels. Steering is via the front drop leg, with a proportional self centring servo unit. The twin wheels in the steering foot remain parallel to the other wheels during turns.

The front leg and foot can be retracted inside the body. When the front leg drops it is held at the correct distance by wires, R2-D2 can then move off at full speed.

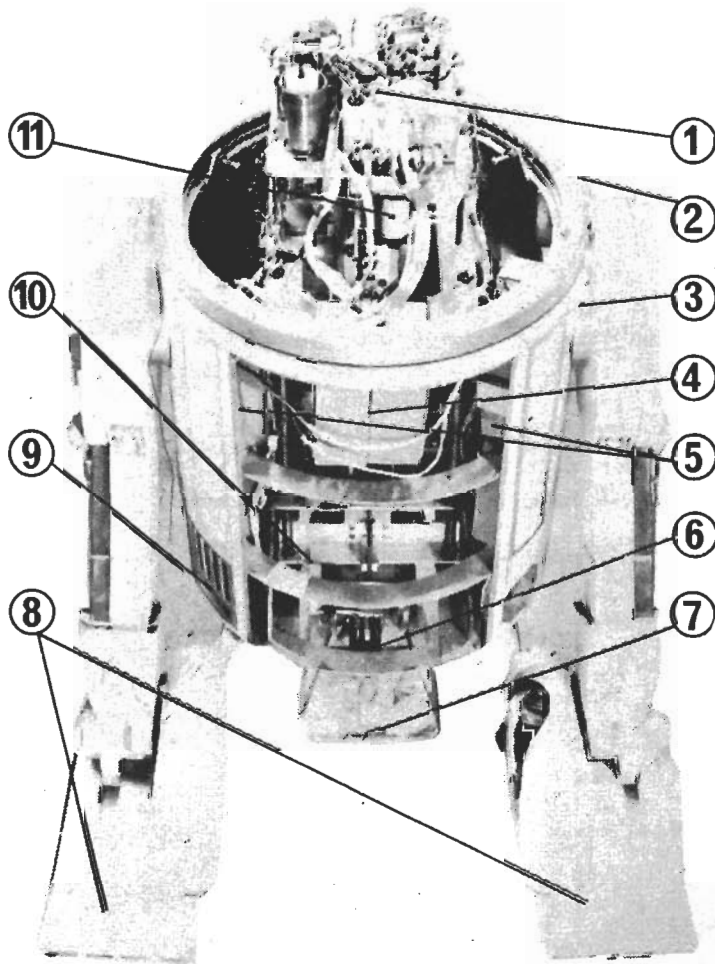
The casings for all the R2s were specially made by a company called Petric Engineering for the modest sum of \$35,000, which may seem a trifle high — but they were precision pieces of engineering to the highest standard, in fact John Stears says they were excellent value.

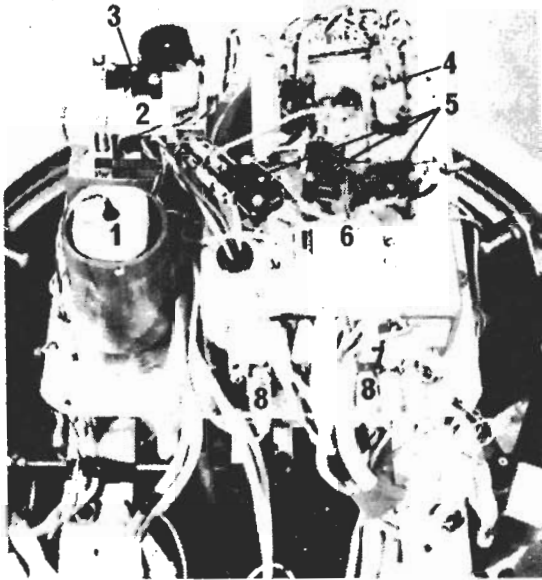
CLEANING UP

For several of the scenes R2-D2 was made to appear thoroughly blasted, or covered in grime. The only way was to virtually blast it in real life, and then clean up for the next shot. While in the Tunisian desert John Stears was also continuously cleaning real dirt and sand from R2, it got in everywhere!

GENERAL

1. Radio control gear
2. Head Ring
3. Shoulder bearing
4. Two 6V batteries for lights and steering (removable)
5. Six 6V batteries for traction (not removable)
6. Headlight switch
7. Front foot (steering)
8. Rear feet (traction)
9. Radio on/off switch
10. Leg drop (mechanical)
11. Leg drop (electrical)



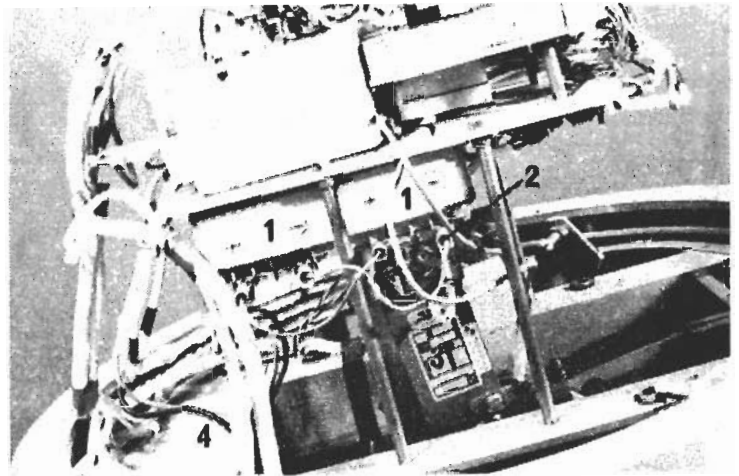


RADIO CONTROL GEAR

1. Deac
2. Main receiver
3. Leg drop servo and microswitches
4. Steering servo and microswitches
5. Speed control microswitches
6. Speed control servo
7. Traction motor connections
8. Traction batteries charge terminals

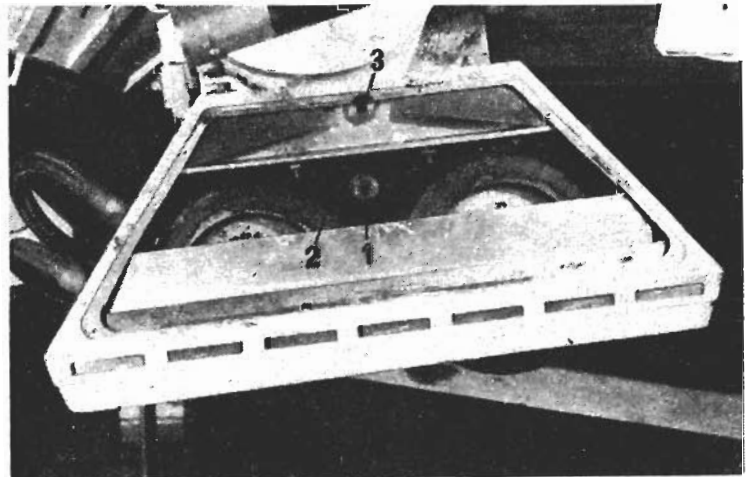
DRIVING FOOT

1. Drive front gear box
2. Chain sprocket, both wheels in each foot driven by single chain
3. Foot retaining pin

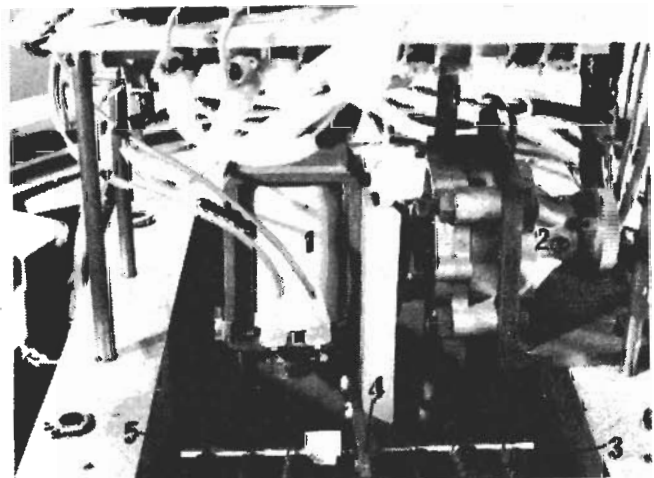
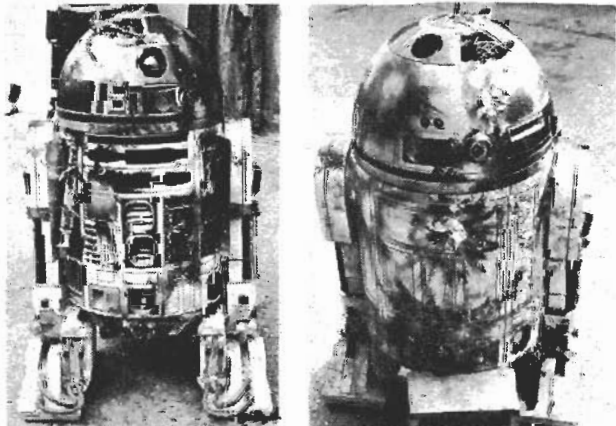


PULSATING LIGHT DRIVES

1. Pulsating light control box
2. Pulsating light connections
3. Leg drop solenoid
4. Light and steering batteries



What a heartbreaking task - blasting such a beautiful piece of equipment!



LEG DROP

1. Leg drop solenoid
2. Damper
3. Body tilt tension springs
4. Leg drop locking arm
5. Leg drop locking rod

Your Personal R2D2

The special effects used in Star Wars have amazed millions. Brian Matthews was inspired enough to build his own version of R2D2. Wally Parsons investigates.

"HOW TO LIVE WITH A ROBOT AND ENJOY IT"

THROUGHOUT THE HISTORY of humanity, one of man's major preoccupations, aside from murder, has been what might be called self replication. Statues and other figures, sometimes in the form of gods also created in man's image have always been with us, but especially fascinating has been the idea of creating life, or at least an imitation of it in human form, more or less. There is some reference to mechanical creatures in the Arabian Nights, although performance is attributed to magic, but the modern concept of a self-contained non-biological creature able to move about like a human being waited for the Industrial revolution and the development of science and engineering.

The word is really a Czech word meaning "worker" and first appeared in the English language in a play by Karel Kapec entitled "R.U.R." (short for "Rossum's Universal Robots"), in the mid-1930's. Since then, robots have been staples of science fiction where they have done everything from running complete space stations to playing winning baseball. Movies and television, leading from the rear, as usual, have finally caught on, giving us such things as a space Robinson Crusoe in which the most interesting character was a Robot, a six-million dollar robot, and even a robot cop (which is only reasonable, I guess).

And then "Star Wars". Even people who haven't seen the film know about the robots, just as a decade ago they knew about HAL, the computer of '2001: A Space Odyssey" whose functions made him, in a sense. But

where HAL was awesome, R2D2 of "Star Wars" is positively cute and even cuddly. Even to the point where already an active market is developing for R2D2 dolls.

But what if a doll is not good enough. Maybe you'd like the real thing, or at least something pretty close to it. No problem. Just build you own. That's what Brian Matthews did, and the results can be seen in the pictures on these pages.



A MATTER OF PROPORTION

Wait a minute! It's all very well to say "build your own" but everyone knows that the original R2D2 carried a hefty five-figure price tag and was built with the resources of a large studio's full special effects department. But

engineers design while inventors invent, and many an amateur has accomplished the impossible because he didn't know it couldn't be done.

Now, Brian has been fooling with radio controlled models for several years, and although he has no real knowledge of electronics and only a high school knowledge of mechanical engineering, he has learned how to make things work. Combine this with amateur boat building, and a sharp eye for detail, along with about a thousand dollars and another R2D2 is born.

A CASE OF ARTIFICIAL SYNTHETICS

When I first saw Brian's creation on television I assumed that a lot of metal-working and plastics fabrication had gone into his construction. Imagine my surprise when I looked inside to discover *plywood*. And the surprise was magnified by the fact that in person R2D2 seemed to be a work of metal and plastic, even to a domed head looking for all the world like anodized aluminum. But this is where the boat builder's skill came into play. The basic body is in the form of a barrel, fabricated from cedar strips glued together to form the barrel shape. Internal components are mounted on a wooden frame which also provide re-inforcement for the body.

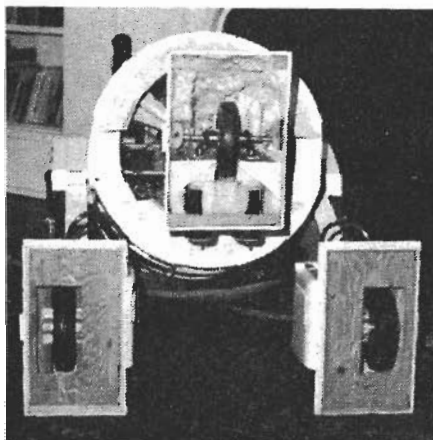
The dome head is the only real departure from the wooden construction, consisting of a single plexiglass dome $\frac{1}{8}$ " thick fitted to a plywood platform in the centre of which is the coupling which fits into a motor at the top of the body, and allowing the head to rotate. Fitted within the head are various lights, pulsating and otherwise.

R2D2

Sounds are produced by a means so simple as to be positively elegant: a cassette recorder fitted with a continuous loop tape and remotely activated. No synthesizers, no radio sound transmissions, just a recorder.

As for the locomotion, here some major departures are made from the original R2D2. While the latter used drive wheels in the base of each of the rear (side?) legs, and steered by rotating the front wheeled leg, Brian's version uses a front-wheel-drive system, although retaining the same steering system. Power is applied via 36:1 step-down gears from each of two 6 Volt motors mounted in the foot. These motors operate in forward or reverse, with two speeds available. The two side legs have wheels which are free-wheeling, and all have feet internally damped with expanded rigid styrofoam to provide sound deadening.

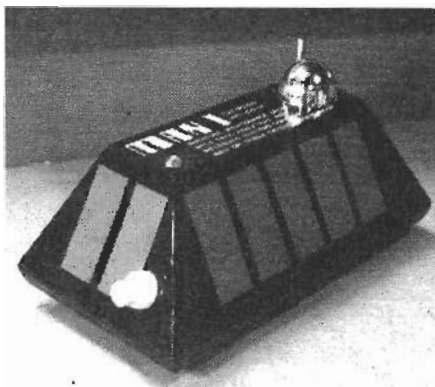
The two side legs are not articulated, that is to say they don't actually do anything except support the rest of the structure. The reason for this is quite simple: much of the design was dictated by parts availability.



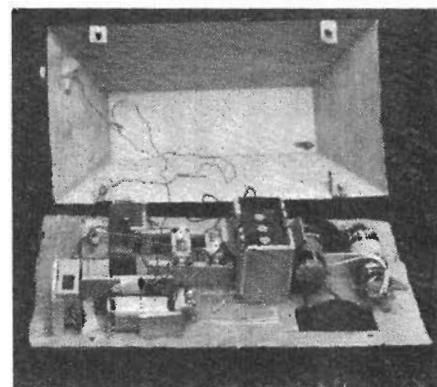
A rather "personal" view of Brian's R2D2.

WHAT YOU HAVE IS WHAT YOU GET

These conditions also dictated much of the rest of the design. Hobby shops, radio-control dealers, and the like, were the source of many of the component parts, and as many of ETI's readers in smaller towns are aware, you can't always get what you want, so you make do with what you have and what you *can* get. For example, since many of the controls were from radio control sources, this meant a 6 V supply, thus locking the builder into 6 V operation.



Max 1, the Box relative, inside and out.



Two power systems are used, one is a 6V 14 AH lead acide battery to provide power for the motors, lights, tape machine, and the other is a NiCd system for the radio control equipment. These are the familiar servo systems and are operated via two RC receivers.

The radio control system consists of two Kraft transmitters and receivers, each of which provides up to five channels, for a total capability of ten channels. Seven channels are used in this version, and they handle the following functions: Sound, Head Turning, Spot Light, Light, Speed, Forward-reverse, and Steering.

R2D2 (Brian's version) stands 3.5 feet high, weighs 43 pounds with batteries, and will run for 2.4 hours on a single battery charge. Finish is enamel, plus silver laquer (mostly for the dome). He (it? she?) was built over a three month period, with 300 hours actual construction time, and was completed on December 23, 1977.

The little fellow seen in some of the pictures is named "Max" and was built

by Matthew Brigden, a friend of Brian's and with whom he shares his RC hobby. Now Max is not exactly a "Star Wars" character, but was inspired by the Box robot that runs around the Imperial Death Star. When I first saw Max I immediately thought of one of those little dogs, all hair hanging down to the floor, and a little red tongue sticking out. He makes a great pet, and was built along the same general principles as R2D2. Actually, Max was patterned along the lines of general impressions gleaned from the movie.

How about R2D2, where did his plans come from? Oh, he was designed from magazine photos.

Readers wishing to meet Brian Matthews and his robot, may from time to time encounter them (closely?) in the observation deck and the restaurant atop the CN Tower where they've been well received by visitors and staff alike. As for Brian's family's reaction, R2D2 occupies an honoured position in the living room.

Meanwhile, Brian's working on a new robot.

Imagine what fun magazine writers have thinking up captions for pictures like this!

