One of Walker's earlier jobs buzzes camera. Walker has been working for years to perfect for public consumption an advanced multi-control "brain."

BATTERIES

▶ The best designed equipment in the world will not operate properly without the correct and proper power supply. Batteries are an essential item in a radio control circuit but very little information has been written on the subject.

The chart on the next page gives the recommended batteries available at all hearing aid suppliers and radio shops. One of the primary things to keep in mind when designing a model and/or radio unit is to use standard and available batteries. Nothing is more exasperating when out flying than to have batteries go dead and then not be able to replace them readily. This is especially true of filament and escapement batteries. Plug-in batteries are convenient but regular flashlight cells are available in almost every store at any time.

The performance of receivers is largely dependent upon the proper voltage. In a transmitter, the loss of voltage will result in a lower output and perhaps cause a slight change in frequency. The type of superregenerative receivers in use today is fairly critical of improper voltages. Ordinarily, battery charts give battery life based on an end point voltage of as low as .8 volts per cell. This means that the "B" supply, which is a 45 volt battery composed of thirty 1-1/2 volt cells, will be shown as having a life, based on an end point voltage, of about 32 or 34 volts. This is definitely too low a voltage for operation of a radio control receiver. The only way correct operation can be assured is to check the batteries occasionally with a good voltmeter. MAKE SURE THE METER IS ACCURATE. A poor or cheap meter will give inaccurate readings and often can prove to be worse than no meter at all. However, an inexpensive meter should not be discarded because of the preceding sentence. Have it checked at your local radio or television service shop, using a good 45 volt (or appropriate voltage for your meter) battery as a standard. Recalibrate the face of your meter to correspond to the correct value.

The "A" supply should not be allowed to fall below 1.2 volts for reliable operation. ALWAYS attempt to check the batteries being tested under load; that is, under actual circuit operating conditions. As a cell grows older, its internal resistance increases due to polarization. This gives a false reading if the battery is tested with no load, with the reading possibly being normal. When any current is drawn from the battery, the voltage immediately will drop and consequently, the current, resulting in reduced power availability. Thus when a battery, which has been used a great deal or has had a long shelf life, is tested under actual circuit conditions, the voltage will be less than the stated voltage on the battery. How much below will depend on the run-down condition of the battery and the amount of current being consumed.

The "B" supply should not be allowed to fall below 41 volts when using the RK-61 or XFG-1, nor below 38 volts on high vacuum tube type receivers. Again, be sure to check voltages when batteries have the load applied.

One of the facts to be remembered when doing winter or cold weather flying, is that the capacity of the batteries decreases with temperature. The ideal temperature for maximum life, consistent with a nominal current drain, is 70 degrees F. With a decrease of temperature, the power output of the cell or cells decreases until very low temperatures may render them useless for the purpose. At temperatures around 20 degrees F. to zero, the output may drop as much as 40 to 60 per cent. On the other hand, an increased temperature will raise the power output of cells temporarily. At temperatures around 90 degrees to 110 degrees F., the output may be boosted about 10 to 15 per cent. If used batteries are heated to about 100 degrees F., the life may be increased temporarily. We say temporarily because at such elevated temperatures, the chemical action of a dry cell is forced, and upon returning to 70 degrees F., the output will be lower than normal.

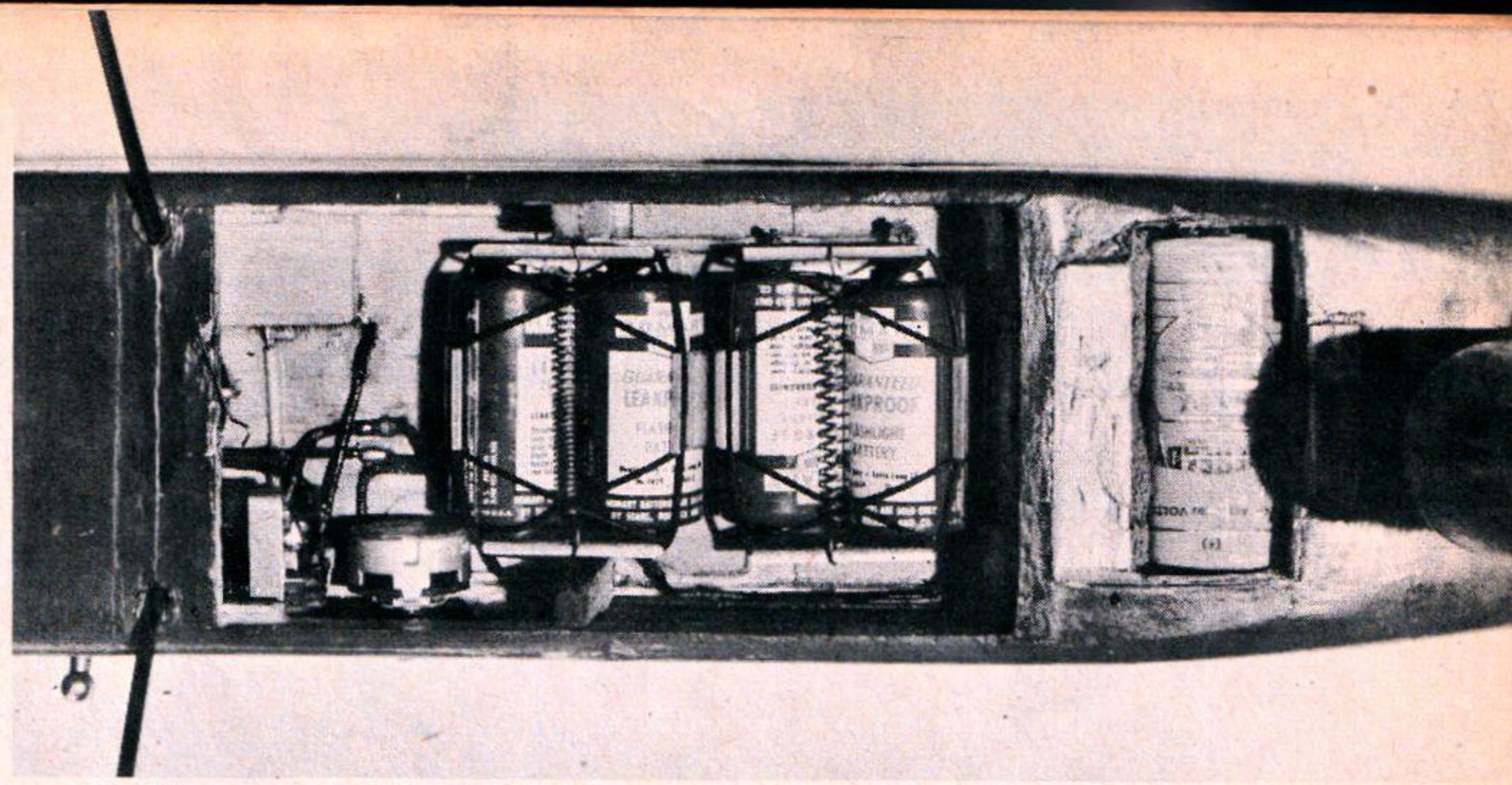
In view of this, the best place to store batteries, especially the small 22-1/2 size, until used, is in your refrigerator. They should not be allowed to become frozen but should be placed where the temperature is between 35 and 50 degrees F. The author recommends buying the receiver batteries (22-1/2 and 45 volts) at hearing aid supply stores. Because of turnover in sales, the batteries are fresher.

An article entitled "Save that Battery" by Herb Owbridge in the March 1949 issue of M. A. N. gives construction and operation details on dry cell battery charging. Well worth reading. You will find that many of your modeler friends have back issues from year to year so that early issues mentioned should not be difficult to locate.

The small mercury type cells, commonly used for hearing filament supply, are not generally suitable for radio control use because of the relatively low current drain per weight. These cells are made in various sizes, the general appearance being a thick disc shape. The initial voltage on these cells is 1.38 volts and, if the current drain is kept low from 40 to 120ma, depending upon the size of the cell, the life is quite long compared to regular carbon zinc cells. However, the cells are about three times as heavy as standard cells on a volume basis. The cost, on an average, is about three to four times that of a small carbon zinc cell.

Wet cells are acceptable for filament and actuator use. If used for filament supply, a dropping resistor will have to be employed to reduce the voltage from 2.1 volts to 1.4 volts.

Batteries cannot be taken for granted. There's the question of size for one thing, type for another. And they are the one factor that requires constant checking. Some tips on battery selection, care, meters, life.



Typically good battery installation showing the 1-1/2-volt A's, the 45-volt B's, three-volt escapement batteries. Batteries should be checked underload before every flying session.

Due to their high current capacity, they are excellent for actuator use. Perhaps the main drawback is that they must be kept charged at all times in order to maintain their efficiency. This often is a disadvantage when out in the field and a battery goes dead. Venner Accumulators Ltd., of England, manufactures a small wet type cell that requires only a few drops of water to put it in operating condition and is capable of being short circuited without danger to the cell. Control Research of Hampton, Virginia, can furnish information on these cells.

Use fresh batteries and clean good connections and be assured of improved performance. Do not use batteries that are too small merely to save weight. It is better to plan on a little extra weight than to have batteries fail prematurely. With reference to the battery chart, those marked * should be used only on AA models where weight and space are of primary importance. The "A" cell can be expected to give about 15 to 20 minutes of continuous life if used with an RK-61 or XFG-1 and the 22-1/2 volt "B" batteries (two used in series for 45 volts) about 5 to 20 hours use, depending on the plate current of the tube.

We suggest the following batteries for the various classes of planes:

Class AA

A Cell	*B Battery*
Eveready 912	Olin 0815
Burgess 7	Eveready 412
	Burgess U15E

Class A

Eveready 915	Eveready 412
Burgess "Z"	Burgess U15E

Class B

Eveready 935	Eveready 420
Burgess "C"	Burgess K15E
Burgess TE	

Class C

Eveready "D"	Eveready 455
Burgess 2R	Burgess XX30
Burgess TE	

Below — Save this battery chart! Everything you need to know is listed right down the line.

R.C. BATTERY DATA

USE	VOLTAGE	SIZE	TYPE OF CONNECTION	MFGR AND NUMBER	WEIGHT	EQUIVALENT
TRANSMITTERS	1 1/2	2 5/8 X 2 5/8 X 4 3/32	PLUG 2744	BURGESS 4F		EVEREADY 742
	1 1/2	4 7/8 X 1 3/8 X 5 9/16	PLUG 2744	BURGESS 4FL		
	1 1/2	4 3/32 X 2 3/4 X 4 1/16	PLUG 2744	BURGESS 6F		
	6	2 21/32 X 2 21/32 X 4 1/8	PLUG 2795	BURGESS F4PI		
	6	4 X 1 1/2 X 10 3/4	PLUG 2795	BURGESS 2F4L		
	45	3 9/16 X 2 1/4 X 4 5/16	PLUG 273	BURGESS B30		
	45	3 X 2 5/16 X 4 1/16	PLUG 273	BURGESS Z30		
	67 1/2	2 3/4 X 1 11/32 X 3 11/16	SNAPS	BURGESS XX30		EVEREADY 467
	90	3 11/16 X 1 9/32 X 3 19/32	SNAPS	BURGESS N60		EVEREADY 490
RECEIVERS	1 1/2	3/8 DIA. X 1 3/4	BRASS CAP	(1) BURGESS 7	.2 OZ.	EVEREADY 912
	1 1/2	17/32 DIA. X 1 31/32	BRASS CAP	(2) BURGESS Z	.5 OZ.	EVEREADY 915
	1 1/2	15/16 DIA. X 1 15/16	BRASS CAP	(3) BURGESS 1	1.5 OZ.	EVEREADY 935
	1 1/2	1 1/4 DIA. X 2 7/16	BRASS CAP	(4) BURGESS 2R	3.2 OZ.	
	1 1/2	3/4 DIA. X 2 7/32	BRASS CAP	BURGESS 5ES	1.2 OZ.	
	1 1/2	1 3/32 DIA. X 3 15/16	PLUG 2744	BURGESS TE	4 OZ.	
	22 1/2	19/32 X 19/32 X 1 15/16	BRASS CAP	(1) OLIN 0815	.5 OZ.	
	22 1/2	1 31/32 X 9/16 X 31/32	FLAT BRASS	BURGESS U15E	1 OZ.	EVEREADY 412
	22 1/2	7/8 X 1 1/4 X 2 5/32	FLAT BRASS	BURGESS K15E	2.25 OZ.	EVEREADY 420
	45	2 17/32 X 31/32 X 4 1/32	SOCKET	BURGESS XX30E	8.75 OZ.	
	45	2 17/32 X 31/32 X 3 21/32	SNAPS	BURGESS XX30	8.5 OZ.	EVEREADY 912
ACTUATORS	1 1/2	17/32 DIA. X 1 31/32	BRASS CAP	BURGESS Z	.5 OZ.	EVEREADY 915
	1 1/2	15/16 DIA. X 1 15/16	BRASS CAP	BURGESS 1	1.5 OZ.	EVEREADY 935
	3	1 3/16 X 1 3/16 X 2 13/32	PLUG	BURGESS 2Z2PI	3.3 OZ.	

OTHER MANUFACTURERS GIVE EQUIVALENT TYPE SIZES IN CASE BURGESS BATTERIES ARE NOT AVAILABLE. BATTERY LIFE IS NOT GIVEN DUE TO WIDELY VARIED USE THEY ARE SUBJECTED TO. ALL BATTERIES LISTED EXCEPT BURGESS 7 AND OLIN 0815 HAVE BEEN BENCH AND FLIGHT TESTED AND WILL GIVE ADEQUATE SERVICE PER WEIGHT.

(1) RECOMMENDED ONLY WHEN WEIGHT AND SPACE ARE PRIME FACTORS.
(2) "PENCELL"
(3) "C" SIZE BATTERY
(4) "D" SIZE BATTERY

WENNERSTROM