Batteries

A conversation at the Lakeside a while ago has prompted this, good idea Ian S & Ian K !

If there is something wrong here or something missing, please speak up and we all learn.

There are numerous types of rechargeable batteries available, a selection which I would pick as the common at the lake are;
Nicads - Nickel Cadmium, AA size Nimh - Nickel metal hydride, AA size and Lipo - Lithium Polymer

NICAD; 1.2 Volt, varying capacity

Been around a while and keep going for a long time if looked after, and that doesn't take much.
If you don't have a charger that has a charge and discharge cycle, chances are you're on a manual timer / temperature / voltage system, and babysitting them is a must. A modern charger is an easier way to go. I have a manual charging chart if you want, please ask, **but it is only a guide.**
Self-discharge; depends on who you talk to and what you read, a compromise might be, they might lose up to about 10% per month and this factor changes with temperature.
Memory effect; depends who you talk to and what you read to establish the facts.
Overcharging will damage them and is possibly dangerous.

My belief for the success and longevity of my own Nicad batteries is that I discharged them back to 1.0V after use for storing and again before I charged them. I also avoided "a topping up charge".

Disposal

I could not find any way of safe disposal or recycling in NZ, except to contact the Local Authorities.
Here is something from Wikipeida.

Ni–Cd batteries contain between 6% (for industrial batteries) and 18% (for consumer batteries) cadmium, which is a toxic heavy metal and therefore requires special care during battery disposal. In the United States, part of the battery price is a fee for its proper disposal at the end of its service lifetime. Under the so-called "batteries directive" (2006/66/EC), the sale of consumer Ni–Cd batteries has now been banned within the European Union except for medical use; alarm systems; emergency lighting; and portable power tools. This last category is to be reviewed after 4 years. Under the same EU directive, used industrial Ni–Cd batteries must be collected by their producers in order to be recycled in dedicated facilities. Cadmium, being a heavy metal, can cause substantial pollution when landfilled or incinerated. Because of this, many countries now operate recycling programs to capture and reprocess old batteries.

Nimh; 1.2 Volt, varying capacity

A derivative of Nicads and very similar construction, one or two material differences.
They are reported to have a shorter working life then Nicads.
DO NOT use a Nicad charging regime and or charger for them.
They can lose up to 4% of their charge per day, with low self-discharge batteries this may range between 15% – 30% per year, all this is relevant to temperature and whose article you read.
The low self- discharge batteries have a lower capacity than the other.
There is nothing about any memory affect
Overcharging will damage them and is possibly dangerous.
Get and use the recommended (preferably automated) charger for them and follow the directions.

Disposal.

I could not find any way of safe disposal or recycling in NZ, except to contact the Local Authorities.

Here is something from Wikipeida.

Improper disposal of NiMH batteries poses less environmental hazard than that of Nicad because of the absence of toxic cadmium. However, mining and processing the various alternate metals that form the negative electrode may pose other types of environmental impact, depending on the metal, mining method, and environmental practices of the mine.

Most industrial nickel is recycled, due to the relatively easy retrieval of the magnetic element from scrap using electromagnets, and due to its high value.

Summary

A 5 cell 6.0V pack of Nimh or Nicads will weigh 150 to 160 grams

Nicad and Nimh do need some TLC to get optimum performance, i.e. power and life.

A bit of an issue is that probably many may have boat and or transmitter batteries arranged in a welded / soldered heat-shrunk pack, this brings up the issue if a cell(s) fails. When that happens, the whole pack can be compromised, any automated charging system will probably be dictated to by the bad cell(s). Those that charge individual cells don't have this problem but they are looking at charging many separate cells and most likely more than one charger.

You can assemble your own battery pack but the heat from soldering may cause damage, the alternative is commercially available packs off the shelf or made for you, sometimes not cheap.

Over-heating during charging can be a headache, if your charger has a heat sensor, use it.

Over-charging is another headache, if your charger has a timeout facility, use it.

Avoid charging in confined places, i.e. in the boat or in the transmitter, this is my opinion only.

Choose the capacity carefully, a high capacity battery will take longer to charge compared to a lower capacity battery but may not give you a real benefit, what do you need and what to choose?

I think you will find the specs for winches, servos and transmitters will show their current drain, that will assist but not dictate in your choice. Some transmitters can have a substantial drain. Get a higher capacity than you need, it's possible the availability will dictate the capacity you get anyway.

Examine potential new batteries carefully, some seem to be having difficulty fitting newer cells into holders, are batteries bigger or are the holders smaller? (I would suggest you avoid plastic holder packs, particularly for in the boat and especially for a Smartwinch)

My own experience is with the old yellow 1100mAh Nicads many of us got. The 5 cell boat pack lasted all Wednesday and still had some left to discharge, it lasted Saturday afternoon and had plenty left to discharge, this was for both for a Hitec winch and later the Smart winch, although much less with this winch. The same with the 4 cell Spectrum transmitter. I used the same batteries for many years, (with the odd cell failure).

Nimh batteries haven't been good to me.

Conclusion

Choose your batteries wisely and get a good charger, at the same time look carefully at how you manage the power use and distribution in your boat, if you have it, use it.

Lipo; (Lithium Polymer, varying Volts, varying capacity

I have to say….. They're fantastic batteries, light, powerful and with a wide variety of configurations. But, they need to be treated with respect, but that's not hard.

About

Batteries can have a varying number of cells, 1,2,3,4,5, & 6 (& greater), known as 1S, 2S, 3S, 4S, 5S & 6S, etc., respective voltages 3.7V, 7.4V, 11.1V, 14.8V, 18.5V and 22.2V, etc.
Each cell is nominally rated at 3.7V (fully charged about 4.2V).
Each battery has a discharge rate, "C", they may also have a "burst rate" **-- see the note below --**
Differently configured batteries will be a different voltage, amperage, weight, physical size and price.
Each multi cell battery will most likely have two leads, one lead for discharge/use and charging, the other lead for cell balancing.
Single cell batteries usually come with 1 lead, possibly a "futaba / JR" (black) servo type socket or "BEC / JST" (red) battery socket, some may have both for consumer convenience. Be cautious as these small sockets and plugs may not handle high currents without voltage drop and heat.
I suggest not to use them in high current situations.
Different suppliers may have different sockets at the end of their battery leads.
Some batteries are better than others and price may not dictate quality.
A 7.2V 1300mAh Lipo battery will weigh about 75 grams. A 1000mAh will weigh about 63 grams.

The following is quoted off an internet site.

The C in C Rating stands for capacity, this is the maximum safe continuous discharge rate of a battery. If you see 20C on your battery, it means it can be discharged at 20 times that pack's capacity. Capacity refers to the milliamp-hour rating of the battery, which will be listed as a number followed by mAh (2000mAh, for example). Here's the easy way to find your battery's discharge rate just multiply the number from the C rating by the pack's capacity. Keep in mind that 1000 milliamps equals one amp. Here's an example, using an 11.1V 2000mAh 10C

11.1 volt 2000mAh -10C
2000 milliamps = 2 amps
2 Amps x 10 = 20 amps continuous discharge.

The burst rate means that for a short nominated period they can discharge considerably more, (follow the same theory as above).

Use

They're handy and useful anywhere and being able to choose the voltage, capacity, physical size, weight, shape and price, makes them extremely adaptable. In our transmitters, (if they fit) they're great, in boats they are perfect. Whatever way, no more issues of all those individual cells and packs.
Beware not to over discharge them, minimum voltage is 3.0V per cell. Unless you have an on-board voltage display, that can be a bit hard to judge. I work on the theory, leave about 20% of the amperage in the battery, this seems to leave the battery at about 3.1V – 3.2V, (works fine for me).
Over discharging may mean your charger will say, "I have a faulty battery and I aint charging it" and it won't either! There are a few ways around this, ask me, as I'm not putting it in writing.

I have found it very handy to have a few extra portable devices that also compliment the chargers; One is a small monitoring/balancing device which can give the voltages of all and each of the cells and balance them as well.
The other is an on-board alarm, this plugs into the balance lead when the battery is in use, it has green and red lights indicating all is OK or low voltage and an audible alarm that sounds when the voltage is low.
Do a bit of work before you commit to buying and make sure the plugs and sockets you get, will handle what you intend to do and you can support in the future.

Charging

THEY NEED A SPECIALISED CHARGER

I use these batteries in my transmitters, planes and boat and have found that taking care to have balanced cells does give better performance and hopefully a longer life. By balancing I mean keeping each of the cells at as close to the same voltage as possible. The cells do become unbalanced, i.e. the cells have different voltages, left in this state while charging and using, you may compromise the battery.
I strongly suggest you always use a balanced charger and keep them balanced (although in saying that, this is not as critical for our use with our boating as it is with other RC hobbies requiring consistent and high performance but still, don't under estimate its importance).
Three types of Lipo chargers are available;
1 - One that will charge through the main lead and balances separately via the balance lead.
2 - One that will charge solely through the balance lead, balancing and charging in one.
3 – One that just delivers a straight charge, (not common), I advise you to have an additional balancing device if you use this type.
Charging through the balance lead is fine but they may charge at a lower rate than charging through the main lead, this is not a problem, just a time factor.
The charger is more important than the battery, I suggest you buy prudently, skimping on this device isn't wise. Consider the following;
Some chargers are single purpose, some will only do Lipo's, others only do Nicad and or Nimh.
Some do Lipo's, Nicads and Nimh, plus, so if you're using a Lipo in the boat and Nicad's or Nimh's in your transmitter, this type of charger might be handy, (maybe you even consider two chargers?).
With a Lipo charger get one with a storage mode, **-- see note below --.**
If you get a multipurpose charger, I suggest chose one that will charge and discharge & has a heat sensor for Nicads and Nimh, a Lipo storage function, also a time out function, handy for all batteries.
Chargers are available either 240V or 12V (usually 11 – 18V). The 240V ones may need to be adapted to NZ plugs if you buy overseas.

My chargers are 12V, so they can run off the car battery as well as 240V. My 12V supply is a 5 Amp 250Watt PC power unit, cost me $2 plus $10 of plugs and switch. I charge my Lipo's at the same rating as the battery, i.e. an 1800mAh battery gets charged at 1800mAh, A 1300Mah battery gets charged at 1300mAh etc., the common term for this is 1C. Some can be charged at 2C or greater, you need to research the battery details, I'm happy to charge at 1C where it takes as long as it does and that's less than an hour anyway. You can also charge at less than 1C quite safely, it just takes longer.

Storage

The following is quoted off an internet site and what I (mostly) do, hence the recommendation for a charger with "storage mode"

A fully charged Lipo cell is approximately 4.2 volts. Lipo's are different from other battery chemistries as they should never be stored fully charged. Lipo's should be stored approximately "half full". Many of the newer Lipo balance chargers have a "Storage Mode" which charges the pack to the proper reduced voltage state for storage purposes. Check your charger manual, some chargers can both discharge the pack and then charge up to the storage level, while others can only charge up to the storage level. The later type charger requires you to discharge the pack below the storage level to take advantage of the storage feature. Storing your packs at the proper voltage level (3.85V) is the simplest thing you can do to lengthen their usable life span (assuming proper application and use). Storage is not just "over the winter". If you only fly on the weekends, your packs are technically in storage all week, week after week during the entire flying season. Those cumulative hours can add up slowly degrading your packs.

Safety

A concern is handling, charging and storage, I also fly RC planes, my batteries do a fair bit of work and sometimes take more than the occasional gentle knock as my boat batteries may get, they also discharge at a far greater rate, so overall they do a lot more.

When a battery is on the charger, I always check the progress, I do not charge them in the house, I do not leave them on the charger (working or not) if I'm not around. If you do vacate the premises TURN EVERYTHING OFF. They should also be charged in a safety bag or confined container.

I store mine in an ammunition box, the majority of the time this box is in a cool place and has the lid shut tight (but confess I am not perfect). Recommended storage is a secure, confining container.

Disposal

Cut off the wires, **ONE BY ONE**, drop the battery in salt water (sea water is cheap!), watch it fizz and bubble, leave it for a good few weeks. Dump the battery it in the rubbish, pour the water down the drain.

Conclusion

If you have Nicads or Nimh batteries, look after them, they're good, but give Lipo's some thought, they can be advantageous.

The need for you to be limited to a "6V maximum" power pack for the boat has gone, there are ways to allow you to use a power supply greater than 6V very effectively, i.e. a 7.2V lipo, that gives you options to, safe guard your electronics, improve the boat and most probably, simplify what you do and they're cheaper than a Nicad or Nimh pack.

I use a 7.2V (2S) 1300mAh 20C Lipo battery in the boat and that lasts Wednesday and Saturday comfortably. I use a 3.7V 4000mAh Lipo in the transmitter and that does Wednesday and Saturday comfortably too. I charge once a week each Tuesday night. After Wednesday they're about 60% discharged, after Saturday they're about 70- 80% discharged, so I don't "store" them.

If you would like some help, talk to Graeme Raxworthy or myself, we have "stuff" that could improve your boating, we also have access and knowledge of things I think many may not be aware of. We will get some more info on options together and distribute it or put it on the notice board.

Happy thinking, Leon