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## Batteries . . . a list server thread.

*A KF Builder wrote:*

*Does anyone know about the Power-Sonic battery I just bought from A/C Spruce? In the catalog it states it is a "Sealed Maintenance free, recombined oxygen cycle battery" (catalog page 324, 26 amp-hour). I took this to mean a recombinant gas battery (RG battery) as recommended by Bob Knuckolls.*

**I agree . . . . this is but one of MANY examples of the RG technology available on the market today . . .**

*Now on opening the package, the invoice I get says it is a "Gell Cell battery" which Knuckolls does not recommend.*

**Only because there's no reason to be satisfied with fair-haired batter products of 1970 when there's so much 1990s product available at reasonable prices. Besides, there's not many places a gel-cell battery can be purchased and more . . . and Power-Sonic isn't one of them. I poked around on the Net for a hour or so one evening last week. I was amazing how many battery distributors don't understand the technologies they sell. For example, Power-Sonic's website makes it very clear that the batteries they offer are the absorbed electrolyte, recombinant gas batteries. A number of Power-Sonic distributors referred to them specifically as "gel-cells".**

**More amazing yet was a distributor site for the Optima brand automotive battery. The Optima has roots in the Gates Energy Products Cyclon series batteries which were the original RG batteries. The Optima herritage has never included gel-cell technology. 20-25 years ago, Globe was really hot into gel-cells. I believe they've since been bought out by Johnson Controls who still produces a few gel-cell devices. The original sealed batteries from**

**B&C were true gel-cells by Sonnenschein . . . the European big guns in gel-cells who still makes a few sizes.**

**The gel-cell has some market appeal for it's deep discharge varieties used in electric wheel chairs and other, leak-sensitive motive power applications. As a cranking battery, it's strictly a warm-weather device. When we did comparative testing of the B&C RG batteries during their STC/PMA efforts, the gel-cell was not even testable at -20F. The flooded battery began the cranking test with lower terminal voltage than the RG battery showed at the END of a 30 second cranking cycle. Clearly, the RG battery was the cold weather cranking winner.**

**I've been recently mis-interpreted to have recommended robust, dual, RG battery installations in every case. This is not true. I strongly encourage the replacement of any battery irrespective of its technology when it falls to 1/2 capacity for reasons documented in numerous articles and posts elsewhere.**

*THEN I call them to clarify, and they refer me to Allied Battery here in Seattle. I was just AT Allied shopping for a battery and they would NOT sell me the same battery I just bought from ACS. Allied said they could not guaranty the battery because it was not meant to be charged from an automotive type regulator.*

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**Another KF BUILDER replied:**

*I have the same battery, it has worked fine for the first 8 hours, I like to know if there is a problem with this installation now that my A/C is aaaaalmost ready to fly.*

I'd be very surprised if it's a real Gel-Cell (and in fact I confirmed later that it was not). . . If operated not over 14.4 volts it will be fine . . .

There is a slight difference in recommended charging voltages between batteries made from "virgin lead" versus various alloys of which may include calcium, antimony, etc. and like to operate at 13.8 for their 100% recharge voltage (room temp) while a few batteries like the B&C products are new, 100% clean lead and are happier at the 14.4 setting.

(I can see where a negative inference could have been drawn here. I used the words "virgin" and "clean" and based on words I got from a battery manufacturer. It wasn't intended to be a whack, simply a justification of a difference in recommended charging scenario. I've investigated this further and find that calcium, antimony and up to 8 other combinations of metals have been used in battery manufacturing. I've also learned that the government has asked battery manufacturer's to use up to 80% recycled lead in their product lines. )

The consequences of operating a virgin lead battery at "too low" a bus voltage simply means that you don't recharge it as quickly nor does it get "topped off" . . . the exact capacity limit is not known to me yet but I suspect it's still better than 90%. Soooooo, difference in performance will be hard to perceive and service life will be good too.

*First the Power-Sonic battery is one of the best true "gell cell" batteries you can use and are available in various sizes. Most experimental acft do not need a big heavy 28ah battery.*

**Agreed, except it's not a gel-cell . . .**

*What is needed is a high cranking amp battery and Power-Sonic is one of several that will start the soob rotax etc with no problem. The amp hour rating is determined by how long you want to be able to fly after the alternator fails. Remember the battery only stabilizes the bus voltage and the current comes from the alternator. A 5 amp hour battery is an overkill as long as you do not need to start the engine and the alternator is running. US Amps have a nice 10 amp hour 1,000 starting amp battery that weighs 10 pounds and is a sealed Gell cell.*

*All gell cell manufacturers will tell you that for long life you must not use the higher voltage of an automotive regulator*

*after the battery is fully charged. This has been discussed before.*

*Any voltage applied to any lead acid battery that is above the room temp value of 13.8 will eventually overcharge the battery and cause damage. You trade off recharge time with battery life in automotive and aircraft applications.*

*Bob would have you believe that only he can supply good batteries and only batteries without calcium are good batteries (calcium in the lead is there by design not because of using inferior materials). The added calcium if any does not change the rater charging voltage from 13.8 to 14.4. That is just not factual.*

*First the powersonic battery is one of the best true "gell cell" batteries you can use and are available in various sizes.*

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*Any voltage applied to any lead acid battery that is above the room temp value of 13.8 will eventually overcharge the battery and cause damage. You trade off recharge time with battery life in automotive and aircraft applications.*

*A battery's ideal charging voltage is a function of chemistry and temperature . . . there's nothing magic or appropriate about the 13.8 volts as a not recommended to exceed value.*

*The fully charged battery charging voltage comes from chemical reactions and does not depend on the lead source. Powersonic batteries will last as long as ANY other brand under the same conditions. They can weigh less and do cost less and perform just as well.*

*Bob also wants you to have two batteries and replace one every year. Then he says to use the old battery for a backup. This results in high cost and weight that is simply not required. Further I would never want to fly with a substandard emergency battery, would you?*

**"Substandard" emergency battery??? I lost you. . . . In any case, you misrepresent what I have written.**

**(1) I don't supply any batteries.**

**(2) There's no issue with the presence of calcium . . . I simply related the justification given to me by a battery engineer who's company chooses to use calcium-free lead hence the higher recommended "cycle service" voltage adjustment.**

(3) I've already determined that many distributors don't know what they're selling. I'll suggest that if they don't know the technology of their products, how can they be depended upon for recommendations as to the care and feeding of the products they sell? When in doubt, go to the original manufacturer.

(4) I DO recommend dual batteries under certain unique conditions:

(a) dual electronic ignition - or any power plant installation that must have absolute reliability of power source and/or

(b) total electric gyros on IFR panel.

How many Kit-Foxes fit these categories?

(5) The swap it out every year recommendation assumes that the owner/operator has no practical way to check all batteries aboard for capacity and replace them when appropriate. Cost? IMHO trivial compared to all other costs of aircraft operation and ownership - especially if well-being of aircraft and pilot **DEPEND** on reliable power. However, Day/VFR flight behind an ol' Lycoming with mags an carb off of an 1930's farm tractor . . . hey, ya oughta be able to fly with NO electrical system . . . Obviously, a dual battery system applies to a small fraction of the airplanes being built.

*Concord, US Amps, Power-Sonic, Excide, and Eagle Picher, and others all make excellent "gell cell" batteries and all have near identical charging requirements for long life (many years). Once you get to the engineering department you get the same story. The more voltage the quicker the recharge and the shorter the life. Annual replacement of a battery when the typical acft is flown under 100 hour is far short of the rated life under proper conditions that can exceed 5 years and 10,000 hours.*

Haven't called them all but my spies in the battery business don't believe any those folk make a gel-cell. They do make perfectly respectable RG batteries. Some still make the same old line of flooded batteries. The really interesting thing I've noticed that some people who sell RG batteries don't know the difference and still call them "gel-cells".

Consider that the battery industry says a battery "shot" at 80% capacity . . . I use 50% as a design standard as long as we've got a way to track it. Trying to tie capacity to calendar life or operating hours simply ignores a host of variables that affect a battery's serviceability in the

assigned task. And yes, I've got customers who have flown some B&C batteries for 5 years or more . . . but all they **EVER** asked the battery to do is crank the engine and stabilize the alternator . . . I sincerely hope none expects these batteries to protect them from a severe case of DPS (dark panel syndrome).

"Proper conditions" you allude to must include confidence that the battery will perform as needed at the beginning, during and end of flight under all anticipated scenarios. If there's no practical means by which the owner/operator would chose to track battery capacity -AND- he's flying in one of the electric-critical flight modes, then what **ELSE** would you recommend? Spending \$50-75/ a year on a new battery seems pretty easy and not terribly expensive.

*What is really lacking is a smart regulator that backs off on the volts once the battery is charged. But then the market for replacement batteries would drop way off :-).*

*The IC for such a regulator has been around for many years but I know of no one making one for acft use. That would be the best solution. A no maintenance battery and no adjustment regulator. Once my acft is completed, this is a simple project that I have planned.*

Agreed. I've discussed this idealized regulator function in numerous posts and with B&C for years. I have data sheets for those regulator chips on file. B&C was the first (and I believe still is the only) one to offer true battery temperature compensated voltage regulators.

I'll not so humbly suggest that no company has extended the leading edge of light-plane electrical systems technology further than B&C. The next generation advancement will probably go to a microprocessor based design with battery recharge monitoring and step down voltage programming and other features not yet defined. What's more, the new regulator will probably cost less than the current offering because it will have about half the parts count.

*I do get upset when a person tries to profit by putting down the competition with false statements or implications of poor materials. Different is not always better.*

My friend, your tension seems to grow from a lack of understanding of what I've written and why. I didn't "put anyone down". The signature under thousands of my posts over the years ask asked for people to "Show me where I'm wrong" so that we might advance the collective knowledge base. I don't recommend dual

batteries for EVERYBODY. I encourage use of modern technology over antiques where there's no good reason not to. I'm the first to admit that an airplane can become airborne with any piece of lead and acid that will crank the engine.

In my not so humble opinion, we have an opportunity to build the best airplanes ever flown but the art will mature ONLY if we make a concerted effort to sort out myth and misinterpretation from fact. That has been the modus-operandi here at the AeroElectric Connection since its inception over 10 years ago. None-the-less, you've suggested that I've disseminated bad information in an effort to achieve some personal gain.

*May 2 he replies and my comments continue . . .*

*(Bob's recommendations are for) two large batteries and three contactors as a response to how to do it for the small auto conversion aircraft where only a small second battery is needed. What an overkill.*

You mis-characterize my words. One already has a battery and two contactors (battery and starter). If one has a flight-critical electrical system the delta weight and dollars involves (1) adding one battery, (2) one contactor and (3) probably downsizing the existing battery. The definition of "need" is where we differ. To my way of thinking, every airplane has one well defined limit as to time of flight firmly established by gallons of fuel aboard. In my opinion, no other system should be designed for any shorter endurance. Why force the pilot to go into emergency because he's got 30 minutes of electrical power when his fuel tanks hold several hours of fuel?

My dual battery installations are seldom installed in auto conversion airplanes and generally replace a single 24 a.h. battery with two 17 a.h. batteries for a weight penalty of about 10# (about the same as the single

"small" battery?). For itty-bitty engines, a pair of 10 a.h. batteries might indeed be more appropriate . . . again, each and every airplane builder has some decisions to make as to how the airplane is configured and used and how much effort is needed to keep an alternator failure from ruining his day.

A pair of 17 a.h. batteries allows us to assume that a less-than- one-year-old battery can depended upon for 12 a.h. of capacity (fits the rule for 3+ hours endurance on a 4 amp essential bus. Obviously, a pair of 10 a.h. requires reconsideration) and a less-than-two-year-old battery is relieved of any and all duties except to insure that the engine stays running. One of the nicest fallouts is the pilot enjoys 34 a.h. cranking performance. If the second battery is expected to support a secondary ignition system and a fuel pump, then a less-than-two-year-old 17 a.h. device seems quite prudent. Identical batteries makes the yearly trade-down possible. Batteries of different sizes cannot be traded down to a less demanding slot on the airplane.

#### Caution

When airplanes with flight-critical electric loads use dissimilar batteries, confidence in system reliability can be maintained only by periodic battery capacity tests.

I don't recommend the same system for everybody, each design needs to be evaluated for its individual system requirements. Further, I've spent untold,uncompensated hours on the phone and via e-mail to assist builders in achieving the best possible installation of what ever hardware they choose to use irrespective of where it was purchased. I would never misrepresent the facts to favor the cash flow of either B&C or the AeroElectric Connection. Please don't paint my recommendations or motivations as being anything different.