

## *Power budgeting for the Wildlife Computers Mk10 Argos/Fast-GPS tags*

In calculating the power budget for the Wildlife Computers Mk10 Argos/Fast-GPS tags, you need to allow for both the Argos transmissions and Fastloc acquisitions. The Mk10-AF, in the 3 x 2/3AA configuration has a battery capacity of 4950 mA-hours (mAh), per the battery manufacturer's specifications. The standard configuration with 4 x AA batteries has a capacity of 8400 mAh, per the battery manufacturer's specifications.

Generally, batteries do not reach the capacity as specified by the battery manufacturer. Tag set-up parameters, animal behavior, and environmental conditions will affect the actual capacity of the batteries. In addition, our experience has shown that the realistic capacity of a battery is 75% of the manufacturer's specifications. Therefore, we suggest you reduce the manufacturer's listed battery capacity by 25% when calculating the power budget for your deployment.

Basic power budgeting guidelines are as follows.

- Each *Argos* transmission takes approximately 300 mA \* 1 second.
- Each *Fastloc* acquisition takes 65mA \* 30 seconds. Note: The acquisition is very fast, but afterward the Fastloc processor needs to untangle the signals. Being conservative, we will use thirty seconds as a pessimistic estimate of the average duration for the processing of the acquisition.
- The rest of the functions of the tag have a minimal effect on the power consumption compared to the Argos and Fastloc requirements.

As an example, for the 3 x 2/3AA configuration, if the tag is set up to make 200 Argos transmissions per day and a Fastloc acquisition every 15 minutes, it will use 69 mAh per day. 4950 mAh will provide power for approximately 71 days. However, taking into consideration the suggested 25% reduction in capacity, this configuration would yield approximately 53 days.

This was calculated as:

- For 200 Argos transmissions per day:  $200 * 300 \text{ mA} * 1 \text{ second} / 3600 = 17 \text{ mAh}$ .
- For 4 Fastloc acquisitions per hour:  $4 * 24 \text{ hours} * 65 \text{ mA} * 30 \text{ seconds} / 3600 = 52 \text{ mAh}$ .
- $17 \text{ mAh} + 52 \text{ mAh} = 69 \text{ mAh}$  per day for the Argos and Fastloc requirements. With 4950 mAh capacity, this equals 71 days (or the de-rated estimate of 53 days).

For the 4 x AA configuration with 8400 mAh, and all other numbers being the same, batteries will provide power for approximately 121 days. Taking into account the 25% suggested reduction, this configuration yields approximately 91 days.

Other combinations of numbers of transmissions and acquisitions may yield more or less days per tag. Recently, we have had reports of Fast-GPS tags lasting for a significantly longer number of days, however results will be highly variable due to specific user parameters and animal behavior. Since each deployment situation is different, the power budgeting method explained here is intended as a general guideline.