



# IGNITING CLUSTERS

It has been noted that many UKRoC teams power their rockets with two or more motors. This technique, known as “clustering”, allows a heavier rocket to be launched using several low power motors.

The reliable ignition of clusters of black powder (BP) motors is a skill that can challenge experienced rocketeers. These guidance notes are intended to help teams to safely ignite all the motors.

## Method One

One method for igniting clusters is to insert an igniter into each motor. By wiring them in parallel the motors should all fire simultaneously.

This method is generally not very reliable in inexperienced hands. If one or more igniters fail to fire then the rocket could have insufficient power to launch safely. Common problems with this method are:

- Failure to put all the igniters in full contact with the propellant.
- Damage to igniters when inserting the plug.
- Short circuits
- One igniter might fire slightly before the others. It lifts the rocket and the cable pulls the igniters out of the other motors so they fail to ignite.

This method is NOT recommended by UKRoC for the National Finals.

## Method Two

A preferred method is to ignite all the motors from a single igniter. If this igniter fires, then all the motors should ignite. If it fails to fire, then none of the motors will ignite. This significantly reduces the problem of partial ignition of the cluster.

The trick is to cut short fuses from quick match and insert these into each motor. The fuses can then be lit simultaneously, by connecting them with tape match or by bundling them together around a single igniter.

When the igniter fires it simultaneously ignites all the fuses. These burn independently at the same rate, and simultaneously ignite all the motors.

Examples of this method are shown below:

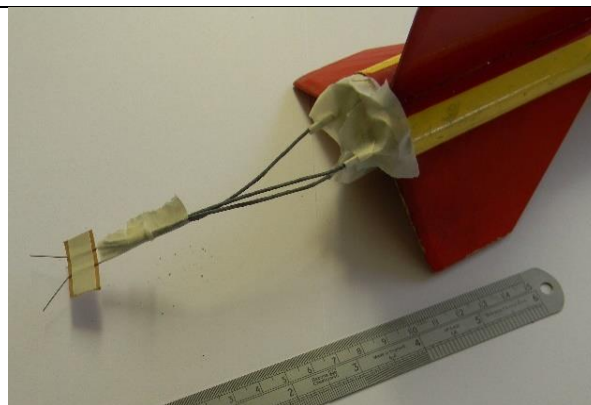
Using five strand quick match (QM), cut a 4 cm length per motor, fold the QM along its length and insert firmly into the D12 motor



Place the motors with QM attached into the rocket. Connect the motors together by using tape match folded over each QM with a single igniter at one end of the tape.



Alternatively: Three single strands of quick match are inserted into the motors and held firm in place using masking tape. The matches are brought together and taped to a single Estes igniter. Note: the ends of the QM in the motor are folded over to improve the reliability



As before, three quick matches are inserted into the motors. This time the matches are connected to the igniter using tape match.





Quick match/tape match materials will be available at the UKRoC National Finals. To ensure safe launches there will be experienced rocketeers in the Rocket preparation area to demonstrate these methods and ensure that teams implement them correctly.