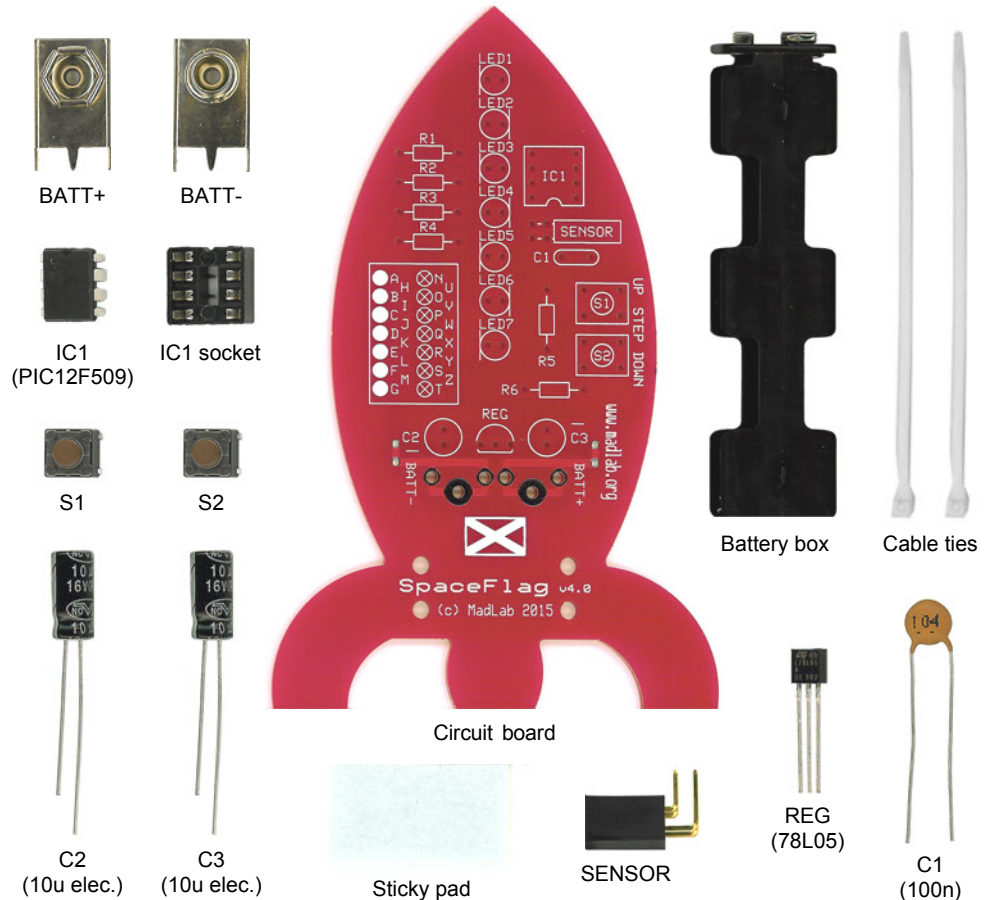
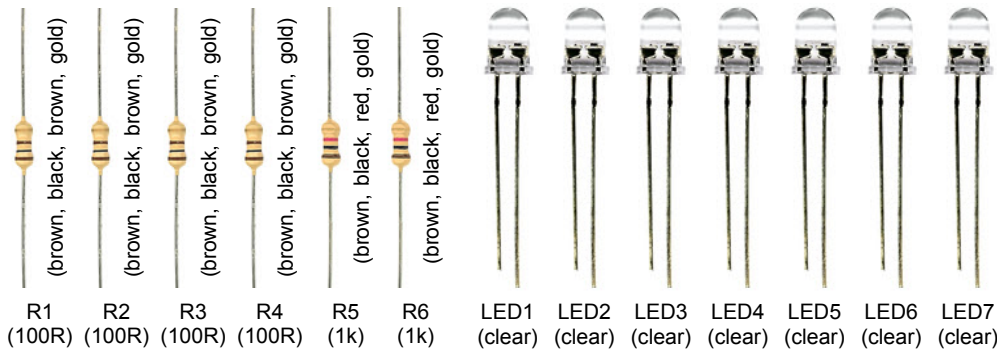
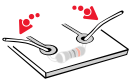


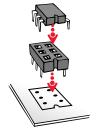


SPACEFLAG

paint messages in the air with light



- 1 Identify the different components using the spotter chart.
- 2 Fit and solder the resistors (R1 to R6) to the circuit board telling them apart by the coloured bands around their bodies. They can be fitted either way around. 
- 3 Fit and solder the electrolytic capacitors (C2 and C3) to the board within the circle putting the shorter leg into the hole with the - sign. The shorter leg also has a stripe on the side of the body. Fit and solder the other capacitor (C1) either way around. 
- 4 Solder the chip socket (IC1) matching the notch in the socket to the notch on the board. **Do not solder the chip directly to the board.**
- 5 Solder the lights (LED1 to LED7) to the board putting the shorter leg into the hole with the line. The shorter leg also has a flattened edge on the rim. Note that the shorter legs alternate left and right. Try to fit the lights in a neat line flush with the board. 
- 6 Solder the regulator (REG) matching the half-circle shape of the regulator to the half-circle shape on the board.
- 7 Solder the tilt switch (SENSOR) such that it lies flat on the board. Be careful soldering it as excessive heat may melt the plastic case.
- 8 Solder the pushbuttons (S1 and S2) either way around.
- 9 Fit the battery connectors (BATT+ and BATT-) to the **back of the board** matching the shape to the symbol on the board (the hexagonal connector is positive, the circular negative). Ensure the connectors are pushed fully into the board and are at right angles to it. Solder the connectors to the **front side** of the board making sure all the holes are well filled with solder.
- 10 Carefully bend the legs of the chip inwards a little with your fingers. Fit the chip into its socket matching the small notch in the chip to the notch in the socket. 
- 11 Attach the battery box to the battery connectors and secure it to the board using the sticky pad. For additional support loop the cable ties through the two pairs of holes (but only fully tightening them when the cells are in place). The battery box acts as the handle for the *SpaceFlag*.
- 12 Insert **4 AA** cells into the battery box observing the correct polarity. If the *SpaceFlag* is working properly all the lights should flash twice.

HOW TO USE THE SPACEFLAG

When you connect the battery to the *SpaceFlag* a standard message (“SPACEFLAG FROM MADLAB”) is programmed into the chip, but you can change this message to one of your own choice (up to 24 characters long using the letters A to Z and the space character). You use the two pushbuttons on the board to do this.

1. First of all clear the original message from the chip's memory by waving the *SpaceFlag* a few times while **holding down both pushbuttons**. This clears the message to all spaces.
2. Now you can enter your new message using the two pushbuttons to enter the individual characters that make up the message. The idea is to go through the letters in the alphabet until you reach the one you want. Pressing the pushbutton marked DOWN (the bottom pushbutton) moves you forward one position in the alphabet (for example from B to C). Pressing the pushbutton marked UP (the top pushbutton) moves you back one position in the alphabet (from F to E for example). You start from the space character, which is followed by the letter A and preceded by the letter Z.

In other words, pressing the DOWN pushbutton once gives you an A, pressing it twice gives you a B, and so on.

3. Once you have reached the letter you want press both pushbuttons together to fix the character in memory and STEP on to the next character in the message. Enter the next character in the same way, then step on again.

Continue in this way until the whole message is entered. Just step over any characters you want left as spaces in your message.

Note that you can't step back to the previous character, you must step all the way through the message and round again.

4. When you have finished just wave the *SpaceFlag* to read your message.

A simple code is used to let you keep track of where you are in the alphabet. Different combinations of the seven lights (LEDs) being on, off or flashing represent all the letters of the alphabet.

The first seven letters of the alphabet, the letters A to G, are represented by one light alone being continuously on. The letter A is represented by the top light on the board (LED1) being on, the letter B by the second light, and so on until G which is indicated by the bottom light (LED7) being on.

The next six letters, H to M, are represented by a pair of lights being continuously on. The letter H is indicated by the top two lights being on, I by the second and third lights, and M by the bottom two lights being on.

The second half of the alphabet uses the same arrangement as the first half, but this time the lights are flashing. The letters N to T are represented by a single flashing light, and the letters U to Z by a pair of flashing lights.

Finally a space character is shown by all the lights being off.

The table printed on the board reminds you of this code.

The *SpaceFlag* stores a 24-character message in its memory, which is displayed 10 characters at a time in a scrolling window.

It works using the phenomenon of persistence of vision (in rather the same way a television works). As the *SpaceFlag* is waved in front of your eyes it paints a pattern of light which to your brain appears as a persistent solid image.

The *SpaceFlag* works best in the dark. It should be possible to read a message from many metres. In daylight you might try pasting a piece of tissue paper over the LEDs to diffuse the light and make the message more readable.

●	A	H	N	U
●	B	I	O	V
●	C	J	P	W
●	D	K	Q	X
●	E	L	R	Y
●	F	M	S	Z
●	G		T	