# NOTES FOR TEACHERS

## Pick n Place Challenge;
## Classroom Activities & Grabber Design Competition

### *A. INTRODUCTION TO FLUID POWER – VIDEO PRESENTATION*

Fluid Power a Force for Change is a 26-minute video. If you don't have time to view the entire video, watch at least the first 10 minutes. The full-scale earthquake simulation that starts around the eight-minute mark is a must-see!

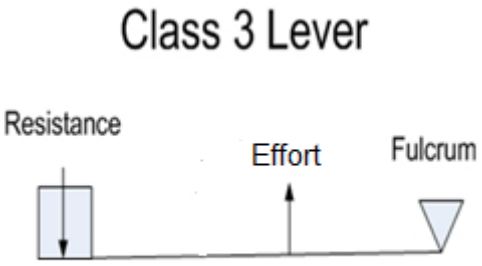
### *B. INTRODUCING THE LIFTER KIT*

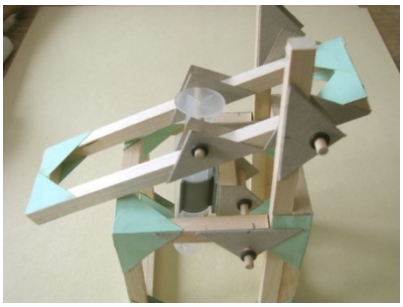
The PDF instructions for building the kit will display on cellphones, but tablets or computers are best.

Constructing the kit involves using green corners, or gussets, to hold the pieces together.

Wood glue is recommended and may be dispensed in small plastic cups using the coffee stirrer provided. Glue is not required between the pieces, and a small amount of glue dries faster, an important point as students are frequently impatient and do not allow the glue to dry.

Building the Lifter demonstrates the use of a strong and stable three-dimensional cube structure and using a "driven" piston, acting linearly, to cause a turning movement through the use of a lever. Machines that use fluid power actuate devices using levers (and other mechanical arrangements) to provide the desired result. In the Lifter the driven actuating piston drives a class 3 lever where the "effort" (the piston) is applied between the fulcrum and the "load" or "resistance" (the arm). The position of actuating piston could be moved closer or nearer to the fulcrum to produce a different result.



An "Introductory Activity" is described on pages 3 and 4 of the Lifter Instructions, ending up with a cube 10cm³. This method of building the cube involves building two squares first (that can be done in three ways - see below*)* and to connect the corners of the cube using two gussets connected together.

*There are three ways to make the square: using (2 X 10cm) + (2 X 8cm) or (4 X 9cm) or (4 X 9cm (long side) using 45-degree miter cuts), showing that there are different ways of assembling the same thing. However, there will be certain circumstances when only one way will do.*

*Two 10cm squares can be combined to create a cube with the addition of four 8cm pieces and then, if not part of the Lifter kit, covered with the Process Cube Sides. The sides will identify the six main steps of a Design Process.*

### *C. LIFTER KIT: DETAILS AND HINTS*

Notice that the parts are cut to size and drilled where needed and that the axle holders (white) are pre-cut and hole-punched and one of the syringes is pre-drilled. It is advisable to have the students pause at page 16. The installation of the white syringe clip on the syringe platform (page 17) is a "one-time" operation and requires the necessary attention.

The Lifter model demonstrates an important technique. If linear-to-rotary movement is required, the syringe must pivot or turn – hence the platform. This is important as undue stress, particularly twisting force or torque, will be sufficient to tear the clip away from wood.

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## *PICK 'N PLACE CHALLENGE EXTENSION ACTIVITY: DESIGN A GRABBER*

The aim of the extension activity is to engage students, who wish to, in a competition to design a system controlled by fluid power and submit their entry in the form of a Design Portfolio electronically. *The students are not required to build the grabber.* Teams may be of one through four students.

The Pick 'n Place Grabber Scenario may be simulated using a long cardboard box cut to size along with the wooden object provided. In that way, students wanting to participate will appreciate the dimensions of the problem and how the lifter fits in, should they wish to use it.

The teacher kit provided is useful here. It demonstrates a working rotating platform operated by fluid power that will turn less when operated pneumatically compared to when it is operated hydraulically. Viewing and operating this kit and building and operating the Lifter allows the students to experience lifting and turning (vertical and horizontal rotation) made from materials that are available for use in the design of their Grabber solution.

### *THE GRABBER DESIGN PORTFOLIO*

The team will need the following:

- A copy of the *Pick 'n Place Challenge Grabber Scenario* and the *Design Portfolio Rubric for the PnP Challenge Grabber*. There are two versions of the *Grabber Rubric:* a short version and a detailed version. The detailed version is a teacher resource (and the judging rubric) detailing how points are awarded. The rubric can be used to show the student(s) how they can maximise their score.
- One copy for each team of the *Portfolio Checklist*, *Portfolio Template* and *Iso-Ortho Diagram*.

Once all this material has been distributed:

a) Read through the *Grabber Scenario* and make it clear that all movements of the designed device must be controlled using fluid power

b) Go through the *Grabber Scenario* paragraph-by-paragraph, accepting questions. A typical question might be "Does the grabber have to lift the object" (Not necessarily) or "Can any part of the grabber touch the floor or the debris? (No)

c) Introduce the short version of the *Challenge Rubric* which will tell the students how their efforts will be graded and use the detailed rubric as you see fit.

d) Stress the importance of the portfolio and refer to the *Portfolio Checklist*, the *Portfolio Template* and the *Iso-Ortho Diagram.*

The team will follow the instructions found in the *Portfolio Check List* and consider the *Portfolio Template*. The *Portfolio Templat*e is the <u>minimum</u> requirement for the portfolio

e) Emphasize the need to explore different designs, as usually the first idea is **not** the best!

f) A good portfolio will have all the required elements and more. For example, the diagrams below do a great job of combining the elements of STEAM.

*(Please note the base in these drawings is very different than the 10cm cube that your students have been instructed to use for the base of their arm/grabber.)*