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21M.735 Tech Note 4: Rigging

Unbalanced Arbors

In its most common application, theatrical rigging consists of a system of counterweights: On one side is the unit or piece of scenery to be flown. On the other is some form of counterweight, usually an arbor that can hold differing amounts of weight, or sandbags. Through a system of pulleys (known alternatively as head blocks, mule blocks, and loft blocks), the two sides are linked, so that when one goes up, the other goes down. The lift lines that are connected at one end to the arbor are usually connected to a pipe batten, which remains in place from show to show. The scenery unit is hung from the batten.

Connected in a simple loop around the head block and down to a floor block is the control line, also known as a hand line. Because the unit is counterbalanced by the weight of the arbor or sand bag, control of the unit's motion involves applying just enough marginal force to overcome the inertia of the unit. This is all well and good, and in most cases is a perfectly fine way to interact with flies, assuming the counterweight is applied correctly and everything is lashed soundly. However, if there are changing loads on the system, a few more complicated methods are necessitated.

Changing loads occur when, at some point during the production, the amount of weight attached to the pipe drastically changes. This could be if a piece of scenery is flown in, detached from the pipe, and the pipe flown back out beyond the audience's sightlines. Alternatively, if a fly is meant to carry humans that will then get on or off the scenery, then the weight that the system is subjected to will change. I remember this happening very clearly from a high-school production of How to Succeed in Business

Without Really Trying: the play opens on the main character, a window washer, suspended 6 feet off the stage sitting on a ladder that was to be lowered in during the first musical number. The ladder was properly counterbalanced, and when it came time for the first dress rehearsal, the actor successfully mounted the ladder. Lights and music came up, the show began, but when it came time to lower him down, as soon as the brake was released, he went plummeting to the floor. Luckily, he wasn't hurt, and even more luckily, the counterweight wasn't dislodged when it bounced after impact, but the message was clear: the counterweighing hadn't been done properly to account for the changing load.

Counterweight is usually altered by sending people up into the weighting rail to change the weight appropriately as the load is changed. However, this is usually impractical in the time frame of a run of the production, and can even be dangerous to the people up on the rail and down below. Thus, other methods must be pursued.

The methods break down into two categories: changing the weighting in response to the change in loading, and increasing the force necessary to overcome the imbalance.

The first category further breaks down into two categories: changing the weight on the bar, or changing the counterweight. The former is relatively simple to accomplish: When the scenery is flown in and detached from the bar, at the same time, a sandbag or other object of equal weight is attached to the bar, out of the visible part of the stage. This is often made easier by attaching a "snatch" line to the bar right above where the sandbag will go, with a metal ring at the bottom or other easy attachment fitting. The sandbag can even be fitted with a dolly to be rolled right into position under the line, clipped right on when the time is ripe, and lifted out by the rigging. The other method,

altering the counterweight, is usually done by a setup known as a “carpet hoist.” The carpet hoist takes advantage of fly rails, where lots of different arbors and all of their associated rigging are lined up along the edge of the stage. In this arrangement, the arbor next to the arbor that will have the changing load is detached from its lift lines , and is thus just the arbor hanging from the control line. Then, the primary arbor has a plate or two sheets attached to its bottom, so that when it comes up underneath the slave arbor, the slave arbor will rest on the connecting pieces. Then, the two arbors will act as one counterweight. This setup is especially good for taking a person on or off a piece of scenery. In operation, the fully loaded scenery is lowered to the ground, and both arbors go up. Then, the scenery is unloaded, and the control line for the slave arbor is braked and tied off to make sure it stays up there. Now, the primary arbor is the only one moving, and it is balancing the reduced batten and drop system. Raising the person back up is as easy as reversing the process: Unit down, person on, slave arbor released, and both then travel under the control of the primary control line.

If these schemes are not feasible, one has the option to increase the pulling power on the control line. This doesn’t address the imbalance, but instead side-steps it. If the same counterweight rigging system is still preferable to use, a block and tackle arrangement can be grafted right onto the business end of the control line. The other major alternative is to bypass the manual route and go into the electric winch domain. Electric winches are designed to pull and pull hard. Thus, they can more easily deal with changing loads, and are often employed without any counterweight rigging as a dead pull mechanism.

Beyond these conventional methods, it is up to the technical designer to see what requirements must be met, and what tools are available in terms of what the theater has to offer. The standard cautions apply as always when working with rigging: The primary requirement is safety, both in operation, and in preparation. Hopefully, these techniques can be used to introduce additional flexibility into rigging design.

Resources:

Gillette, A.S. Stage Scenery: Its Construction and Rigging. New York, Harper and Row: 1972

http://www.atoztheatrical.com/riggingpage.html

http://www.aact.org/cgi-bin/webdata_terms.pl?fid=1070140275.19201&query=pagenum%3D1%26cgifunction%3DSearch%26Term%3D%255EC&cgifunction=form

http://www.aact.org/cgi-bin/webdata_terms.pl?fid=1070140275.87204&query=pagenum%3D1%26cgifunction%3DSearch%26Term%3D%5ER&cgifunction=form

http://www.gweep.net/~prefect/pubs/iqp/node54.html