

# TOTAL PRODUCTION

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## *Into The Great Outdoors*

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# Industry Watch

## Flying Tonight

Andrew Martin, President of ATM Fly-Ware, presents his philosophy on how to safely and successfully get sound in the air.

**A**s sound companies and contractors struggle to survive in the competitive marketplace, they are seeking ways to reduce costs and/or differentiate their products and services from their competitors. This fundamental truth of doing business in a competitive industry becomes more pronounced when considering non-primary products within a sound system.

A loudspeaker rigging system is not necessarily a product that can easily be sold as a benefit to a client. The job becomes more difficult when the client is made aware of the expense of purchasing a professionally manufactured loudspeaker rigging system. However, if approached properly, the fact remains that a professionally manufactured rigging system will result in savings for the client, and can add to net profitability for the contractor. When the economic advantages are combined with the legal protections afforded by a rigging system incorporating product traceability and product liability insurance, it becomes a quick decision for the client that the rigging system expense brings value-added features to the sound system for a nominal investment.

It is the position of the vast majority of court systems that the designer, seller, representative, installer, and owner of the rigging system accept the moral and legal responsibilities of safely suspending the sound system. This position translates into liability exposure for all parties involved in the purchase and/or use of the sound system. For this reason, loudspeaker flying hardware systems should not be purchased or employed unless the user is fully aware of the implications, and is fully insured for damages resulting from rigging accidents.

Aside from each party involved being insured and/or generating appropriate hold-harmless agreements, there are other ways to reduce the likelihood of being held partially or wholly responsible for damages resulting from an accident. A key protection for all parties involved is that found under the umbrella of product traceability systems. Product traceability enables manufacturers of products to identify the history of a part's construction and strength. The purchaser and/or end user can use this information to prove the part was strong enough for the application. If it is possible to prove the part was structurally safe, then it becomes a simple matter of demonstrating the correct use of the product. With appropriate rigging system design, it is likely that all

liability will be diverted from the parties involved with the rigging system. It is for this reason that only products certified for overhead suspension and incorporating product traceability controls should be used as components for rigging systems. In some countries, overhead suspension standards exist that make some form of product traceability a requirement.

### A PRIMARY CONCERN

After the financial and legal obligations surrounding the use of a rigging system are addressed, safety becomes the primary concern for the flying hardware system. When examining flying hardware system safety, start with the loudspeaker enclosure itself. Flyable loudspeaker enclosures are mandatory. Many loudspeaker manufacturers offer loudspeakers with some type of flying hardware in place. Most of these loudspeakers have been designed and constructed to be flown, and have been tested to ensure their safety. However, an engineering data sheet (certification) should always be kept on record that details the strength ratings of any manufacturer's flyable loudspeaker enclosures.

Some non-flyable loudspeaker enclosures can be modified and suspended safely. Internal bracing and enclosure modifications can strengthen the enclosure sufficiently. These types of modifications should only be made with the loudspeaker manufacturer's consent, and a rigging consultant should always be involved. The same applies to proprietary loudspeaker enclosures. In either case and without exception, structural testing and certifications must be obtained before the loudspeaker flying system can be used.

There are many considerations when studying the different types of loudspeaker enclosure flying hardware. At all times, a design factor must be exercised throughout the entire system. A design factor is a factor of redundancy built into the system that adds safety: the professional rigging industry's self-regulatory design factor is 5:1. A 5:1 design factor means that every component's yield strength or ultimate load strength is divided by a factor of five; the resultant is the working load limit of the component. For instance a cabinet fitting with a yield strength (load at which the part begins to break) of 1,000kg would have a working load limit of 200kg. With this in mind, the difference in rigging system alloys becomes an important element. Steel alloys have greater strength than aluminum alloys. Also,

## ESSENTIAL RIGGING

steel alloys have a tendency to bend long before they break, whereas high strength aluminum is brittle and can break suddenly. If the loudspeaker enclosure hardware is being borrowed from another industry, such as the aircraft or cargo control industry, it is important to find out if the hardware is approved for overhead suspension applications. Much of the hardware that looks like standard aircraft or cargo control hardware is not, and most aircraft and cargo control hardware should not be used for overhead suspension purposes because it is not rated for overhead suspension.

In almost all instances, flyable loudspeaker enclosures utilise some variation of internal bracing. Usually the internal bracing is fastened directly to the external flying hardware component — this distributes some of the load throughout the loudspeaker enclosure and increases the load capacity of the enclosure. The external part of the enclosure flying hardware system can take many different forms. Perhaps the most common systems are the threaded hole, the nut plate (threaded plate), the pan fitting, the stud fitting, and cargo control track.

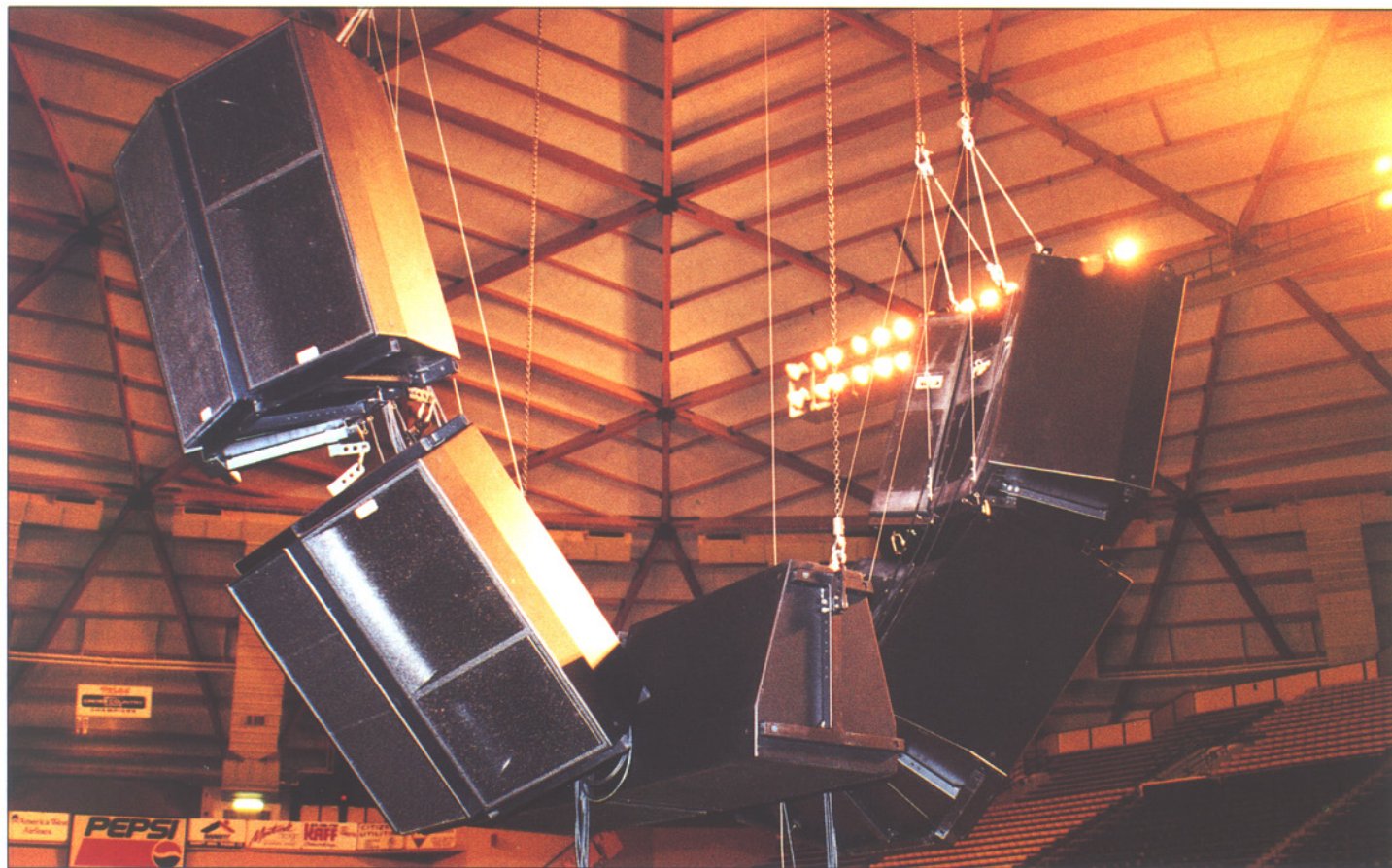
Once the loudspeaker enclosure is suited for flying, the flying hardware system is the next consideration. For the most part, flying hardware systems can be categorised into several distinct groups; grid truss (strap type) systems, modular grid truss systems, and modular mounted-truss systems. A grid truss, or strap type, flying hardware system makes use of an overall top truss from which the loudspeakers hang. Straps and cables hold the loudspeakers in place and adjust the tilt to the loudspeaker columns while each loudspeaker is suspended by the one above it and so on.

Grid truss flying hardware systems are easy to design and can appear to be cost effective at first, however, this type of system can become very costly if used long term. It is difficult to control the loudspeaker array direction and splay characteristics in a grid truss system as well. For this reason, a grid truss system is very labour intensive and provides poor acoustic wavefront coherency. The modular mounted-truss flying hardware systems use compact truss modules that are permanently affixed to the loudspeaker enclosure. The modular mounted-truss systems array the loudspeakers well and maintain a coherent acoustic wavefront. System designs are simple and assembly is intuitive. Also, modular mounted truss loudspeaker flying hardware systems assemble quickly and with a minimal number of crew members.

### INSIDE THE VENUE

With a viable loudspeaker rigging system engaged, the next focus of attention is the venue, with safety at





the top of the checklist. Loudspeaker array locations should be as far away from people as possible. Attachment to the venue should be appropriate, and should be performed only by a qualified professional rigger. When assembling the loudspeaker array, be conscious of the surroundings at all times. Check and then double-check the array assembly to ensure that the rigging system is assembled properly, and that all attachment hardware is tight and showing no signs of wear or fatigue. Remember that the ultimate responsibility for any accidents that may occur falls on the owner of the loudspeaker flying system.

Other components of the rigging system include shackles, wire ropes, carabiners, straps, round slings, clips, chain motors, beam clamps, and various other rigging hardware. All of these components must be designed and implemented into the system with the 5:1 design factor discussed earlier. Also, all of the components must be rated for overhead suspension. Aluminum carabiners and carabiners without locking

gates have no place in a loudspeaker rigging hardware system. If forged eyebolts are implemented in the system, they must be of the shoulder variety and the angle of load must be thoroughly understood before the bolts are used. Shackles, quick-links and clips must also be thoroughly understood, and the rules that apply to the direction of load must be observed. In many cases, the angle of the load will cause a decrease in the working load limit of the component in excess of 50%. Remember that the loudspeaker rigging hardware system is only as strong as the weakest link in the system.

The loudspeaker rigging hardware system can be the safest system in the world, but the venue must be able to support the load in order for the system to be of benefit. Specific load points should be available at any venue where loudspeaker arrays are to be flown. Venue load points must be engineered and load rated with a design factor in place and for a specific load angle. Many times, venues will have specified

suspension points in the ceiling structure; these points must have a specified working load limit. Don't take the building owner's word for it, ask for proof: remember who is responsible if there is an accident. Larger venues may have a support structure constructed from steel, concrete, or wooden beams. Again, any suspension point should be load rated and the 5:1 design factor must be applied. In any case, a qualified professional rigger should do the work performed to attach to the venue structure.

Flying loudspeaker enclosures can be a challenging, however, the benefits of a suspended loudspeaker system are tremendous. The added intelligibility and increased gain distribution can turn a mediocre installation into a brilliant success. Nonetheless, the process of flying loudspeaker enclosures must be approached with one primary concern at all times — SAFETY.

Andrew Martin



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