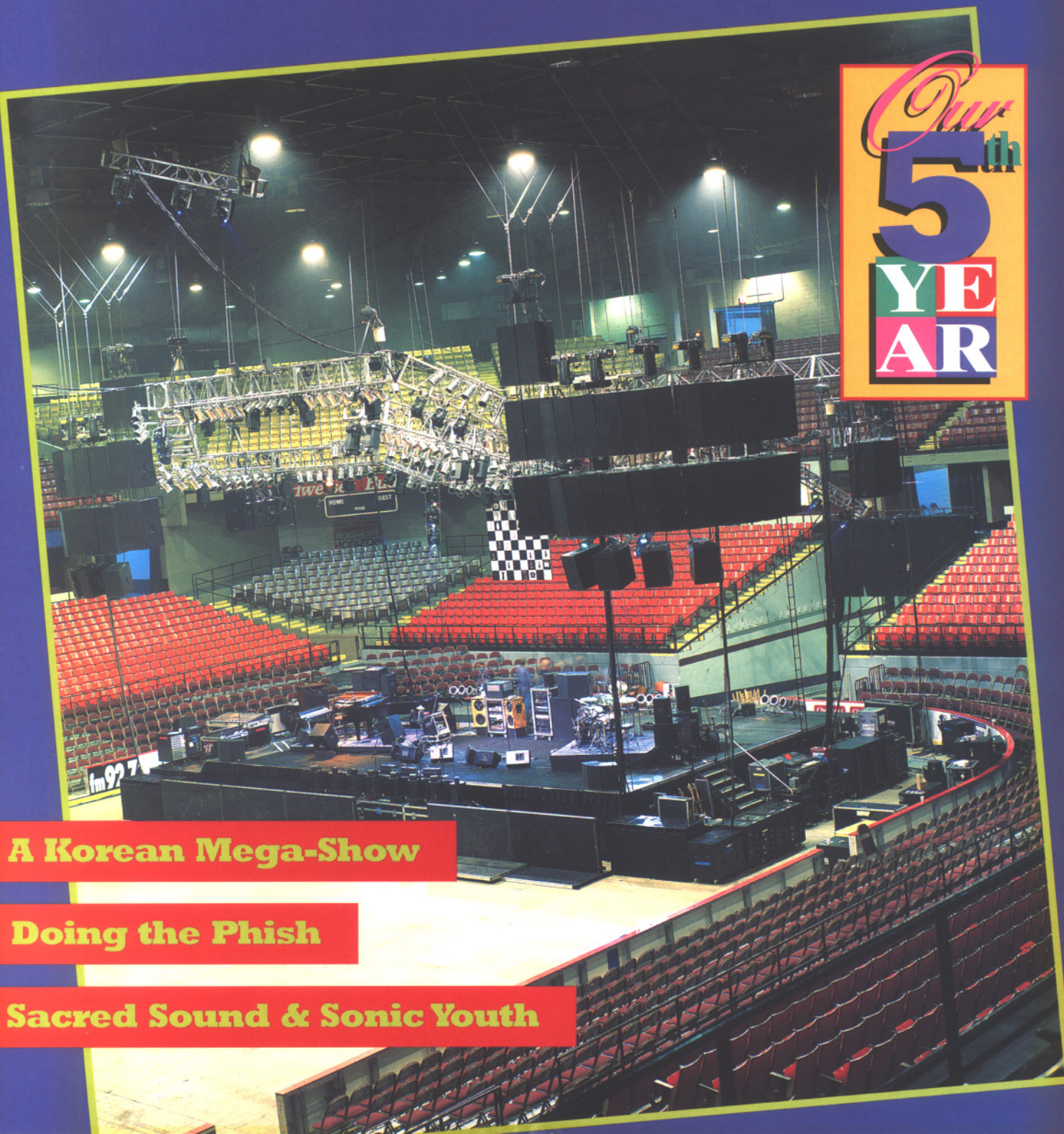


LIVE SOUND!

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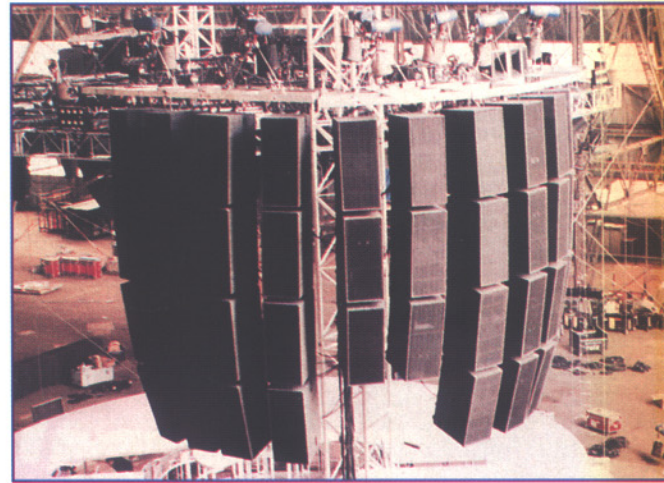
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by Andrew Martin

Rigging Loudspeaker Systems

A Serious Investment

A safe flying hardware system is an indispensable part of a safely operated sound reinforcement system. So there is no acceptable argument against appropriate funding for a loudspeaker flying hardware system that will insure safety and beneficial use.

It must also be remembered that a safe and competent flying system requires a considerable, but less obvious, planning and logistical investment. Still, when approaching the sound reinforcement system as a whole, the flying hardware system chosen for the loudspeakers is a relatively small part of the overall system cost.

The Right Thing to Do

The owner of the sound reinforcement system accepts the moral and legal responsibilities of flying loudspeaker enclosures when he/she employs the use of a loudspeaker flying hardware system. Be aware that any damage, injury, incident, or other misfortune that can be related to the flying hardware system will most likely result in litigation.

This is why loudspeaker flying hardware systems should not be purchased or employed unless the user is fully aware of the implications, and fully insured for damages resulting from rigging accidents. Assuming that the financial, logistical, and legal obligations of utilizing a loudspeaker flying system are addressed, safety becomes the primary concern for the flying hardware system.

When looking at the 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 insure their safety.

However, an engineering data sheet 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

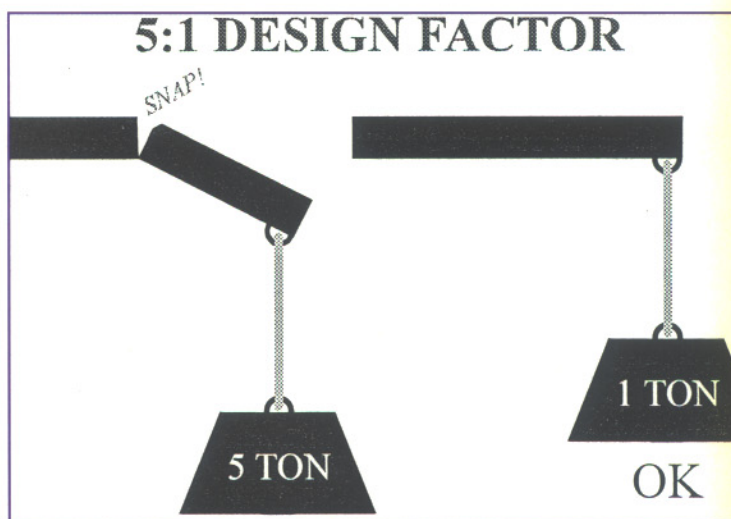
modifications can strengthen the enclosure sufficiently.

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, structural testing and certifications must be obtained before the loudspeaker flying system can be used.

How to Think About It

There are many considerations when examining various 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 safety built into the



Graphic #1: The 5:1 Design Factor

system. The professional rigging industry's self-regulatory design factor is 5:1. (see Figure #1)

A 5:1 design factor means that every component's yield strength or ultimate load strength is divided by a factor of 5; 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 1,000lbs(454kg) would have a working load limit of 200lbs(91kg).

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With this in mind, the difference in rigging system alloys becomes an important element. Steel alloys have greater strength than aluminum alloys. Also, 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 determine 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 cannot be used for overhead suspension purposes.

Flyable loudspeaker enclosures almost always utilize 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.

Much of the hardware that looks like standard aircraft or cargo control hardware is not. And most aircraft and cargo control hardware cannot be used for overhead suspension purposes.

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.

Truss Flying Systems

Once a loudspeaker enclosure is suited for flying, the flying hardware system is the next consideration. Flying hardware systems can be generally categorized 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 uses an over-all 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 when used long term.

It is difficult to control the loudspeaker array direction and splay characteristics in a grid truss system. For this reason, a grid truss system is labor intensive and provides poor acoustic wavefront coherency.

The modular mounted-truss flying hardware systems use compact truss modules which are permanently affixed to the loudspeaker enclosure. 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 crew.

At The Venue

With a viable loudspeaker rigging system engaged, our attention turns to the venue and safety. 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



Photo #1: A Promix (NY) System

the array assembly to insure 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 accidents 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 components must be designed and implemented into the system with the 5:1 design factor discussed earlier.

Also, all of these 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 eye bolts 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

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weakest link in the system.

Does it Carry That Weight?

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 should be engineered and load rated with a design factor in place and for a specific load angle. Many venues will have specified suspension points in the ceiling structure. These points must have a specified working load limit. Don't take the production manager'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, the work performed to attach to the venue structure should only be done by a qualified professional rigger.

Flying loudspeaker enclosures can be a challenging. And the benefits of a flying loudspeaker system are substantial. The added intelligibility and increased gain distribution can transform a potentially mediocre show into a brilliant success. But in all cases, the process of flying loudspeaker enclosures must always be approached with one primary concern—SAFETY. **LSI**

Andrew Martin is President of ATM Fly-Ware, Carson, CA.

ATM Fly-Ware is a manufacturer of loudspeaker rigging hardware systems, internal bracing hardware, and other rigging accessories as well as a consultant for loudspeaker rigging applications. You can con-

Loudspeaker Flying Check List

- ✓ Strong Finances
- ✓ Morally Responsible
- ✓ Fully Insured for Rigging
- ✓ Enclosures are Built for Flying
- ✓ Structural Certification In hand
- ✓ 5:1 Design Factor in Place
- ✓ All Rated for Overhead Suspension
- ✓ Qualified Riggers Doing Work
- ✓ Equipment Used Properly
- ✓ Using Venue Specified Points
- ✓ 5:1 Design Factor on Venue

Graphic #2: Loudspeaker Flying Checklist

tact ATM Fly-Ware at VOX (310) 834-5914 / FAX(310) 834-3042, or by mail at 21000 S. Wilmington Avenue, Carson, CA 90810-1247 USA.

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