

Performing Arts Safety Bulletin #14

PERFORMER FLYING AND AERIAL STUNTS

Performer flying and aerial stunts involve much greater potential for serious or fatal injury than normal performance activities. This document provides general guidelines for the principles of safe design, risk assessment, rehearsal and performance.

OVERVIEW

Performer flying and aerial stunts require the supervision of a fully trained and experienced professional stunt co-ordinator, the use of appropriate engineering and specialized equipment. The title of the flying director/stunt coordinator/rigger may vary, but that person, to be qualified, must have the appropriate experience, expertise and ability to ensure a safe and secure work environment in order to give people the ability to create their art.

This bulletin uses the title “stunt coordinator” to refer to the qualified person. British Columbia health and safety regulations define a *qualified* person as follows: they must be knowledgeable of the work, the hazards involved, and the means to control the hazards, by reason of education, training, experience or a combination of these.

All parties involved in performer flying or aerial stunts should know who is responsible for each aspect of the effect.

DESIGN AND CONSTRUCTION

1. Fly systems should be designed:

- for simplicity and reliability in operation, and durability in repeated use;
- to ensure predictability and repeatability of motion;
- to include a passive secondary that takes weight only if the load-bearing component fails; and
- to include a control option to easily permit movement outside the cue sequence in an emergency.

2. Conduct load calculations with due regard to the load capabilities of the components.

3. In the case of manually-operated fly systems, ensure movement and control of the performer are within the physical capabilities of the operator(s) and performer.

4. Ensure hardware and other technology is appropriate and adequate for the intended use.

5. Equipment used (ropes, lines, cables, harnesses and hardware) should be designed to support the weight of the performer comfortably and to bear live loads. The equipment should be manufactured for that purpose or be of an equivalent standard. All components should be marked with a load rating, either attached to or engraved on the component or, in the case of rope, included in accompanying documentation. The stunt coordinator should approve the use of all equipment.

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6. Harnesses should fit correctly and be specific to the performer's size and weight. The harness is part of the rigging, **not** part of the costume. Any costume elements worn over the harness must not impair the vision, mobility and/or safety of the performer. No part of the costume can be attached to the harness without the express permission of the stunt coordinator and only in the manner in which he/she approves.
7. Costumes, wigs and props required to be used or worn by the performer should be presented to the stunt coordinator in sufficient time for evaluation and to determine if such items will impact the effect. Final safety approval rests with the stunt coordinator.
8. Performers on flying props must be secured to the prop by cables and harnesses.
9. Equipment should be rated at a minimum breaking strength to load ratio of 10 to 1.
10. All structural components that may injure a worker in the case of failure must be designed with appropriate factors of safety.
11. Ensure proper guarding of operating controls that might be activated unintentionally and use proper guarding of moving parts that might pose a hazard.
12. Ensure adequate clearance between the performer and any other element or structure.
13. If needed, there must be a firm base (platform or scaffolding) from which to fly. These units must be properly secured so that they do not move.
14. Compile documentation on equipment capability, operation instructions and safety warnings including identifying hazards, to be made available to operators.
15. Establish a plan for response, rescue and recovery in the event of breakdown of any mechanised element. Rescue plans and procedures (including how to rescue a suspended performer) should be developed specifically for the system in use.

SYSTEMS GUIDELINES

1. The manual controls shall be clearly labelled and easy to understand and use. Operators shall know and understand how to use the controls.
2. There will be clear access to the load-in point for the performer and operator.
3. There will be sufficient visibility to hook up, check and operate the flying systems properly.
4. The drop zone, fly area (aerial arena) and landing point will be clear of obstruction according to the instructions of the stunt coordinator.

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5. A fall arrest system should be incorporated into the rigging system. The system should include a method (rescue plan) of safe retrieval of the performer or operator should the fall arrest system be used.
6. A reliable communication system between the performer, operator and ground crew will be established and agreed upon.
7. The operator will be in a position that is secure and free from obstruction and distraction.
8. When the operator is unable to hook up the performer, a qualified person will be assigned to do so.
9. Static or fixed lines intended for active loads such as swinging or climbing should not be tied off directly to abrasive structures that may damage or weaken the primary lines. Components such as webbing, rope or cable, which are susceptible to wear due to abrasion, should be backed up with a passive secondary.
10. Passive secondaries should be used when tying off load-bearing lines or ropes and should be installed in positions that will minimize the shock load if any load-bearing point fails.
11. The use of poles, bars, hydraulics, etc. and other specialized flying systems that do not use fall arrest and passive secondaries must include adequate precautions under expert supervision to ensure performer safety.

TRAINING AND REHEARSAL

1. All aerial stunts and flying systems should have an assigned stunt coordinator.
2. Each performer should be notified of potential performer flying and aerial stunts prior to engagement. The engager should consider the capabilities and physical fitness of the performers and may request advice from the stunt coordinator prior to casting.
3. The engager should encourage the performer to communicate to the stunt coordinator any information (such as a fear of heights) or conditions (such as a previous injury) that would restrict their ability to perform.
4. The stunt coordinator should review the schedule in consultation with the employer to ensure that adequate time is provided based on the show requirements and the capabilities of the operator and performer.
 - The operator, performer and spotter (if used) must:
 - be given adequate, progressive training and rehearsal time with a stunt coordinator.
 - do full dry-tech testing of the system under expected loads and operating conditions.

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- conduct sufficient tech rehearsal to ensure predictable and safe operation of the fly system.
 - There should be sufficient time to integrate the effects into the action of the full production, with all its performers and movement of scenery
 - If understudies or back-up operators are used, they require full training and rehearsal by the stunt coordinator, equal to that of the person they are replacing.
5. Familiarize the performers and crew who will be involved in the sequences with the components of the flying system:
- Identify standards and ratings on the harness, connectors, anchor points and other components.
 - Explain how a qualified person will inspect and ensure all components of the system are in good repair.
 - Demonstrate how to put on the harness, adjust it and inspect it. Identify the qualified person who will inspect the harness adjustment before every rehearsal and performance.
 - Explain the cueing and operation of the sequence, as well as communication for stopping or indicating a problem.
6. Before every flying rehearsal or run-through conduct testing of all components of the system in its complete range of motion for operators and performers. The testing should include as many elements of actual performance as initially determined by the stunt coordinator, including props, costumes, sound and lighting.
7. For tech and rehearsals, establish a communication system and chain of command, starting with the stunt coordinator. All communication should be initiated by or go through the stunt coordinator.
8. For tech, rehearsals and performances, ensure the operator, performer and spotter have a clear communication method for stopping or indicating a problem.
9. If stage layout or dim lighting precludes clear operator view of the fly system or performer, ensure a spotter is assigned, as necessary.
10. Where changes are made to any sequence that includes flying, ensure that changes are made and tested by authorized qualified personnel and that additional rehearsal is held to establish familiarity and comfort with the new sequence.
11. If the assigned stunt coordinator is not part of the running crew or cast, he/she will train a replacement to carry out pre-performance testing and inspection of all flying systems and equipment and to schedule any necessary stunt or fly call before the performance.

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IN-SHOW OPERATION

1. Conduct pre-show testing of all components of the system in its complete range of motion. The passive secondary deployment should be checked during pre-performance inspection. For harness inspection, refer to the Actsafe Stunt Harness Inspection video.
2. All flying systems, equipment, ropes, knots and other tie-offs should be checked for wear, damage and integrity before every performance. If any defects are found, there should be no flying of performers until the system is repaired and restored to perfect condition.
3. Monitor and operate machinery safely with an eye toward unexpected occurrences and malfunction.
4. Ensure operational changes are made only by authorised and qualified personnel.

MAINTENANCE

1. Ensure maintenance and inspection are done by qualified personnel.
2. Establish a maintenance schedule, with a method of documenting the maintenance work done. *The Actsafe Stunt Harness Logbook* can be used for this purpose.
3. Conduct maintenance according to the schedule, and more frequently when any observed behaviour of the system warrants it.
4. Immobilise mechanised elements for maintenance activities where any operation of the fly system would pose a hazard.
5. A retirement schedule for the replacement of equipment should be established by the stunt coordinator. The stunt coordinator determines which equipment, if any, needs such a schedule. If the integrity of any fly equipment is in doubt, it shall be retired from service permanently or repaired and recertified by the manufacturer.
6. Check with the manufacturer's instructions before using any cleansers, markers, paint, or stickers on components or equipment. No part of a harness can be cleaned, dyed, painted or marked with a substance that might degrade the strength and/or integrity of the harness materials.
7. Use appropriate containers to store fly equipment to avoid moisture, abrasion, dirt, ultraviolet light, extreme temperatures and other hazards.

NOTE: One type of equipment or action may be substituted for another, so long as the safety of all parties involved in the effect is at least as great as it would be without the substitution.

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OCCUPATIONAL HEALTH AND SAFETY REGULATIONS

Not all requirements under the Occupational Health and Safety Regulations are discussed in this safety bulletin. This is not a definitive guide to the legislation and does not exempt readers from their responsibilities under applicable legislation. In case of inconsistency between this resource and the occupational health and safety legislation or any other legislation, the legislation will always prevail.

REFERENCES

For additional information, refer to:

- *Stunt Harness Inspection* video: www.actsafe.ca/resources/videos/stunt-harness-inspection/
- *Stunt Harness Logbook* – available free from Actsafe upon request
- *Performing Arts Safety Bulletin #7 – Rigging Systems and Flown Scenery*
- *Performing Arts Safety Bulletin #9 – Stage Combat, Stunts and Weaponry*
- *Stunt Safety Inspection Checklist*:
www.actsafe.ca/wp-content/uploads/2009/03/Stunt_Safety_Inspection-List3.pdf
- *WorkSafeBC OH&S Guideline Part 11.2-6 Fall protection during stunt work*
www2.worksafebc.com/publications/ohsregulation/guidelinepart11.asp#SectionNumber:G11.2-6