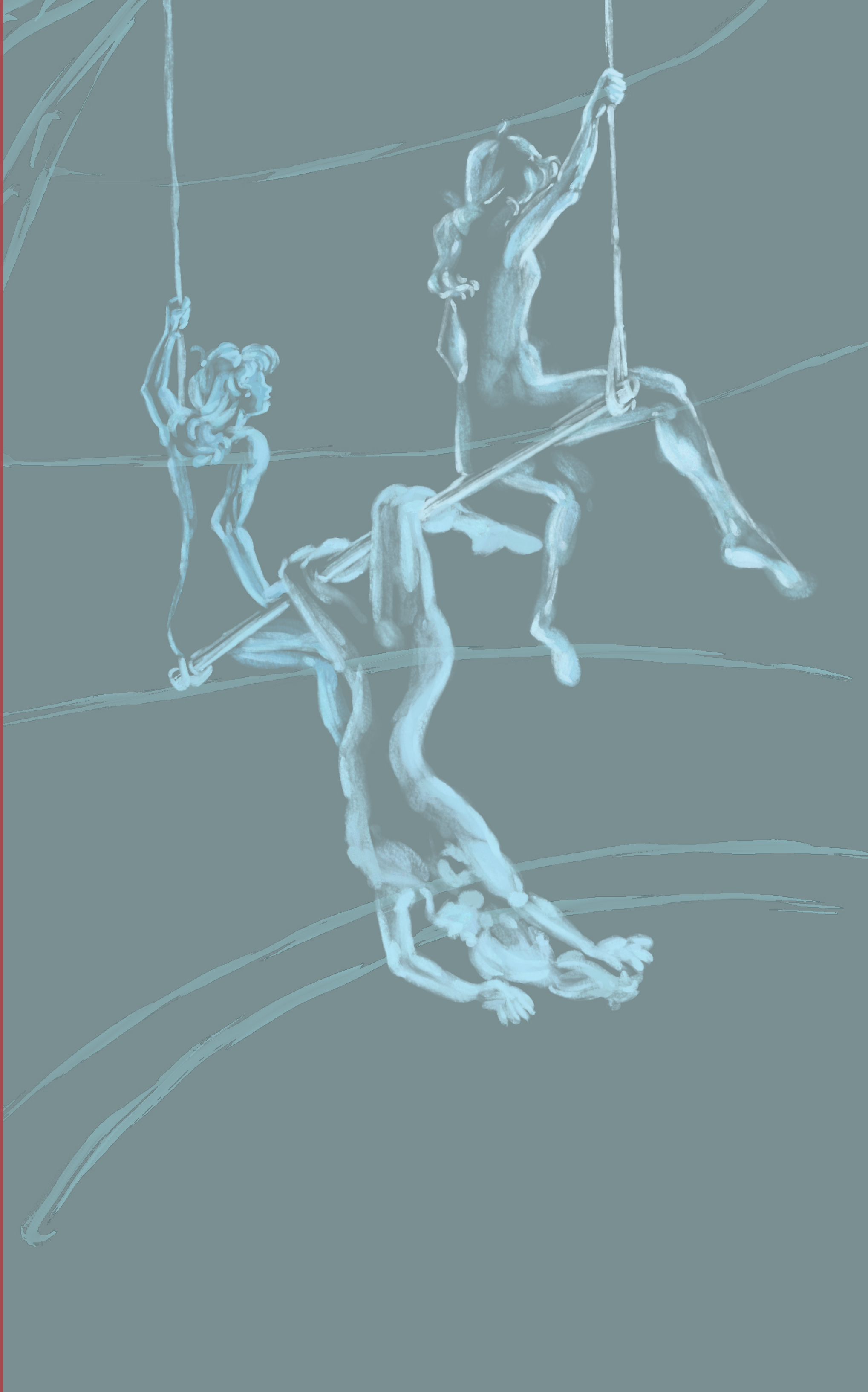
Guide to the Design of Circus Apparatuses and Equipment

Introduction to the key steps and fundamental guidelines

Paloma Leyton
Marion Cossin, Franziska Trapp
Ginger Ana Griep-Ruiz, Fred Gérard, Elia Seclet, Melanie Stuckey



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Credits

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Note: The "Trapèze Toulouse" apparatus is a fictional reproduction of a piece of equipment depicted in the drawing titled *Le trapèze volant*, created by Henri de Toulouse-Lautrec in 1899. Imagining it as a project for developing a new circus apparatus—and solely for the purpose of illustrating this guide—we have produced concept sketches, illustrations, and technical plans inspired by this object.

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HUPR Research Centre for Human Potential
In Synergy With National Circus School Montreal

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Acknowledgments

This guide came to life thanks to the invaluable support and contributions of many individuals and organizations. We sincerely thank the experts who generously agreed to take part in the supporting interviews.

We also express our gratitude to the team at the Research Centre for Human Potential (HUPR), affiliated with the National Circus School, whose discussions and feedback greatly enriched this work.

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The English version of the document was revised by Aeris Millaudon, a student at the National Circus School.

This document is the result of a collective effort.

It is based on interviews conducted by Marion Cossin (PhD, Research engineer at the HUPR Centre) between the summer and fall of 2022 with seven representatives of various circus companies, one supplier-manufacturer, and four acrobatic designers. It also draws on observations gathered by Franziska Trapp (PhD, Université Libre de Bruxelles) during her research stay at the HUPR Centre in the summer of 2023, which included interviews with ten circus equipment designers.

Interviews carried out by Paloma Leyton (PhD candidate, artist-researcher) between the summer and fall of 2025 with experts Saar Rombout (artist-researcher and rigger, Stockholm University of the Arts), Masha Terentieva (artist and designer), Fred Gérard (apparatus and performance environment researcher/designer), Elia Seclet (research project lead design), Marco Bortoleto (PhD, Unicamp), and Bilbo Rochette (rigger, National Circus School) also contributed to this work.

Finally, Ginger-Ana Griep-Ruiz, artist and acrobatic designer, contributed to the writing by sharing insights from her background and field experience. The document was also reviewed by a committee to ensure the accuracy and clarity of its content. This committee was composed of Patrice Aubertin (HUPR) and Emmanuel Bochud (HUPR), as well as other individuals who prefer to remain anonymous.

The Research Centre for Human Potential (HUPR) carries out projects in collaboration with a wide network of partners. Focused on the performing arts and human potential, HUPR provides applied research and technical support, as well as information and training to assist professionals in the field. Through a transdisciplinary approach, it supports artists and organizations in integrating knowledge and tools to foster sustainable innovation and push the boundaries of creation.

Creating New Equipment

Designing new circus equipment can be a challenge, sometimes hindering initiatives due to a lack of technical knowledge or expertise. Often, promising ideas emerge without a clear understanding of how to bring them to life, who to contact, or what to expect from the design process; a process that is, by nature, rich in iterations.

With this in mind, the Research Centre for Human Potential (HUPR) has developed this guide to support artists who wish to embark on this creative journey. Our goal is to bring together coherent information about the stages of equipment design, provide reference points that help prevent safety issues, and give guidance regarding the challenges associated with project management. We also aim to promote safe creative practices within an approach that, while still largely unregulated, lies at the heart of the ongoing evolution of circus arts. This guide also seeks to raise awareness among practitioners who wish to bring their original equipment ideas to life.

Designed as a true companion, this guide aims to support artists and creators from all backgrounds in developing equipment that serves their artistic vision. Rather than prescribing a single approach, we have gathered a diversity of perspectives to provide accessible and inspiring reference points throughout the process. Our intention is to dispel uncertainty and encourage best practices, and to help reduce the inherent risks of creative work involving new and untested apparatus.

Because equipment design is a vast and constantly evolving field, this guide does not claim to be exhaustive. Instead, it offers adaptable reference points that can be adjusted to the specific realities of each practice.

Most of the recommendations, regulatory frameworks, and references presented in this guide are based on the Canadian context. Some of this information may be transferable to other countries, while other aspects are specific to Canada. It is therefore advisable to verify which elements apply in your region.

Circus Equipment Design: A Vast Field

The design of new circus equipment is a vast field that can give rise to a wide range of approaches. It spans different scales of creation and production—from individual projects to large international companies—and encompasses various types and levels of work.

For example, creating a new circus apparatus is not the same as optimizing an existing one, just as designing equipment involves different challenges than designing a performance environment. It is important to grasp these distinctions from the outset in order to clarify the project's intentions.

Thus, the design of an acrobatic or circus apparatus involves the invention of an object intended to support the practice of an acrobatic or circus activity, rather than the exploration of the bodily possibilities it enables—which instead falls within the realm of act or performance design.

Along those same lines, one can distinguish between the adaptation of a piece of equipment (how to make it better suited to a particular body or specific use) and its optimization (how to improve its efficiency to enhance performance). At the same time, both of these notions apply to mechanical, material, and safety-related aspects. All these examples differ from the design of a performance environment, which concerns the material and human conditions, as well as the processes that influence performance.

Although this guide focuses specifically on the design of circus apparatuses, each of its sections (ideation, stages of the design process, funding, project management, etc.) can also be applied to the other types of design defined above as well.

introduction & context

Why Invent a New Apparatus?

There is no single answer to this question. A new apparatus may be created to meet concrete needs, optimize performance, or stand out and enhance competitiveness. It could be built as a response to technological, cultural, or social evolutions in the world. The aim may be to experience a new sensation, embody a new line of research, and explore new possibilities. Or it could simply be born out of passion, curiosity, chance, or even serendipity.

The invention of a new apparatus can emerge naturally from the evolution of one's own practice. For example, when the possibilities of an apparatus have been fully explored, the need for a new object may arise, allowing acrobatic research to progress further.

Innovation can also stem from a desire to stand out: creating an apparatus that is truly your own—shaped by your learning process and the challenges you've encountered—can become a source of personal fulfillment and a way to assert your uniqueness. It may also open the door to professional recognition, production, and even commercialization of your apparatus. You might offer workshops to share your concept internationally or choose to protect it in order to retain exclusive use and creative control.

The emergence of a new apparatus can also respond to an artistic need for exploration, such as the instinct to rethink why and how one engages with their own practice. In these cases, the apparatus can become a vehicle for unique exploration, guiding one towards unexpected aesthetic territories still waiting to be discovered.

Of course, no approach can be considered more legitimate than another; motivations are multiple and deeply personal. As a common thread, however, it can be noted that novelty lies at the very heart of the genealogy of circus (and the arts more broadly), where tradition is built through a succession of renewals—each transforming, adapting, or reinterpreting the forms that came before.

This guide does not aim to privilege one approach over another. Whatever your reason for designing a new apparatus, it is meant to accompany and support you throughout your creative process.

introduction & context

Creation, Invention, Innovation...

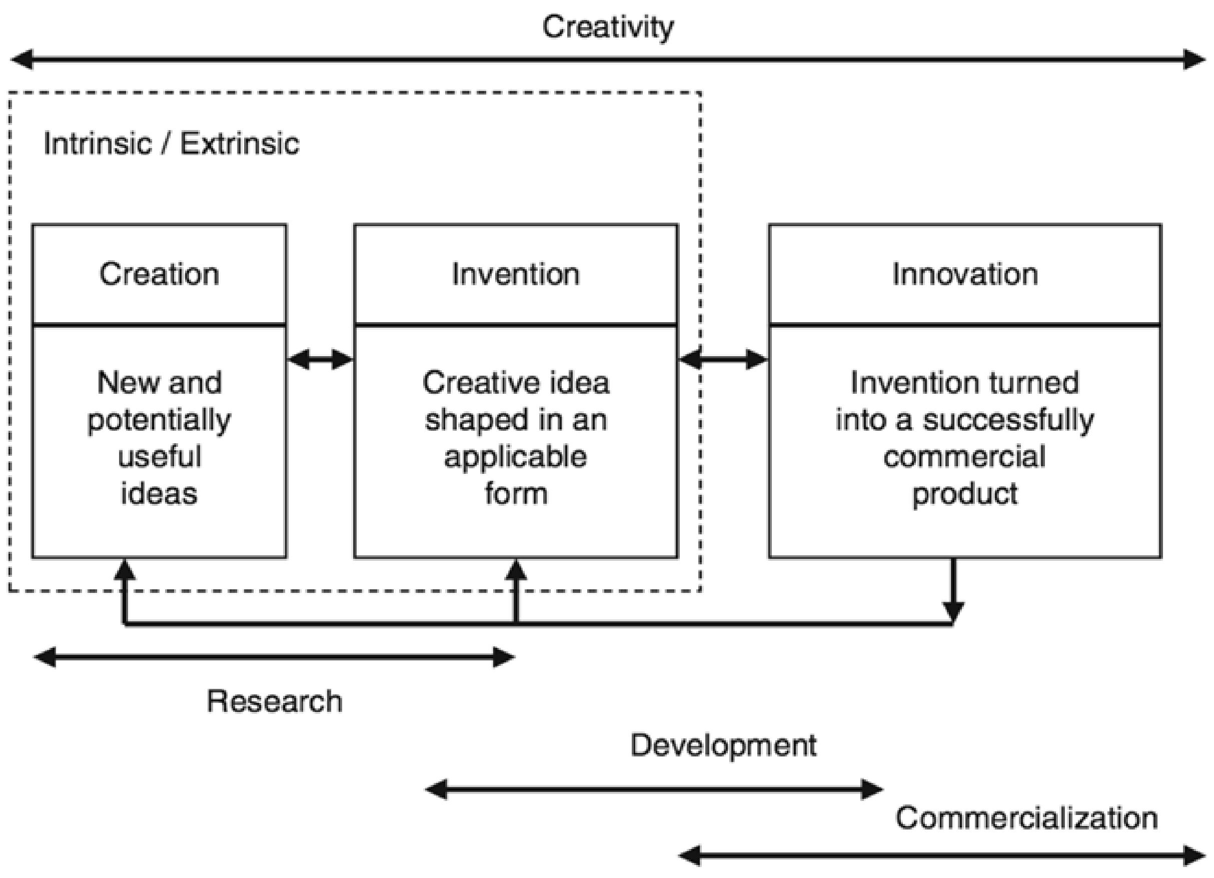
Because designing objects that can support human bodies in acrobatic use inherently involves both artistry and engineering, it is necessary that the development of a new circus apparatus engages with the notions of creation, invention, and innovation equally. It exists within a dual logic—artistic and technical.

• **Creation** involves the generation of new ideas or artifacts, whether entirely original or derived from the reconfiguration of existing elements in the world.

• **Invention**, in turn, refers to the materialization of these ideas into tangible or conceptual novelties, representing a form of applied research in the arts.

• **Innovation** designates an invention that is successfully adopted, commercialized, and/or integrated into a sociocultural environment. It brings improvements to practices, methods, or artistic forms while pushing the boundaries and conventions of their traditions.

A new idea, if it remains unused, stays at the stage of invention.



Courvisanos S.J. 2013 « Business Cycle ». Springer Encyclopedia, p.149-155.

...in Circus Apparatus Design

To date, no official organization or standard regulates the development of circus equipment. Nor does any unifying framework exist to distinguish whether a given process constitutes creation, invention, or innovation. In fact, for many practitioners, the boundary between innovation and discipline remains fluid: the redefinition of a discipline can lead to the emergence of a new apparatus, just as certain newly invented apparatuses can, over time, evolve into full-fledged disciplines.

Circus disciplines encompass the specialties specific to each acrobat and can be described as follows:

"At the root of the circus language, they energize the development of circus arts as much through the evolution of techniques as through the invention of new apparatus. Circus disciplines also determine the aesthetics of the acrobatic body, each offering its own register of circus gestures. They are grouped into broad categories according to the apparatus used as well as the aptitudes and skills required to practice them."

(Barlati, 2024, BnF reference)

When applying the notions of creation, invention, and innovation to circus equipment, they can be understood as different stages of an evolving process—from the initial idea all the way to its integration within circus practices.

However, this process is not linear, and these concepts are not prerequisites for undertaking an apparatus development project.

• **Ideation** corresponds to the birth of an original idea and the formulation of strategies to bring it to fruition.

• **L'invention** involves the technical realization of the original idea in the form of a prototype that is both functional and safe. This often entails work in design, engineering, fabrication, and experimentation, and may also lead to a reworking of the technical vocabulary that develops around the apparatus.

An invention may remain unknown or never fully realized for various reasons; a lack of dissemination of context, installation complexity, high cost, or logistical challenges.

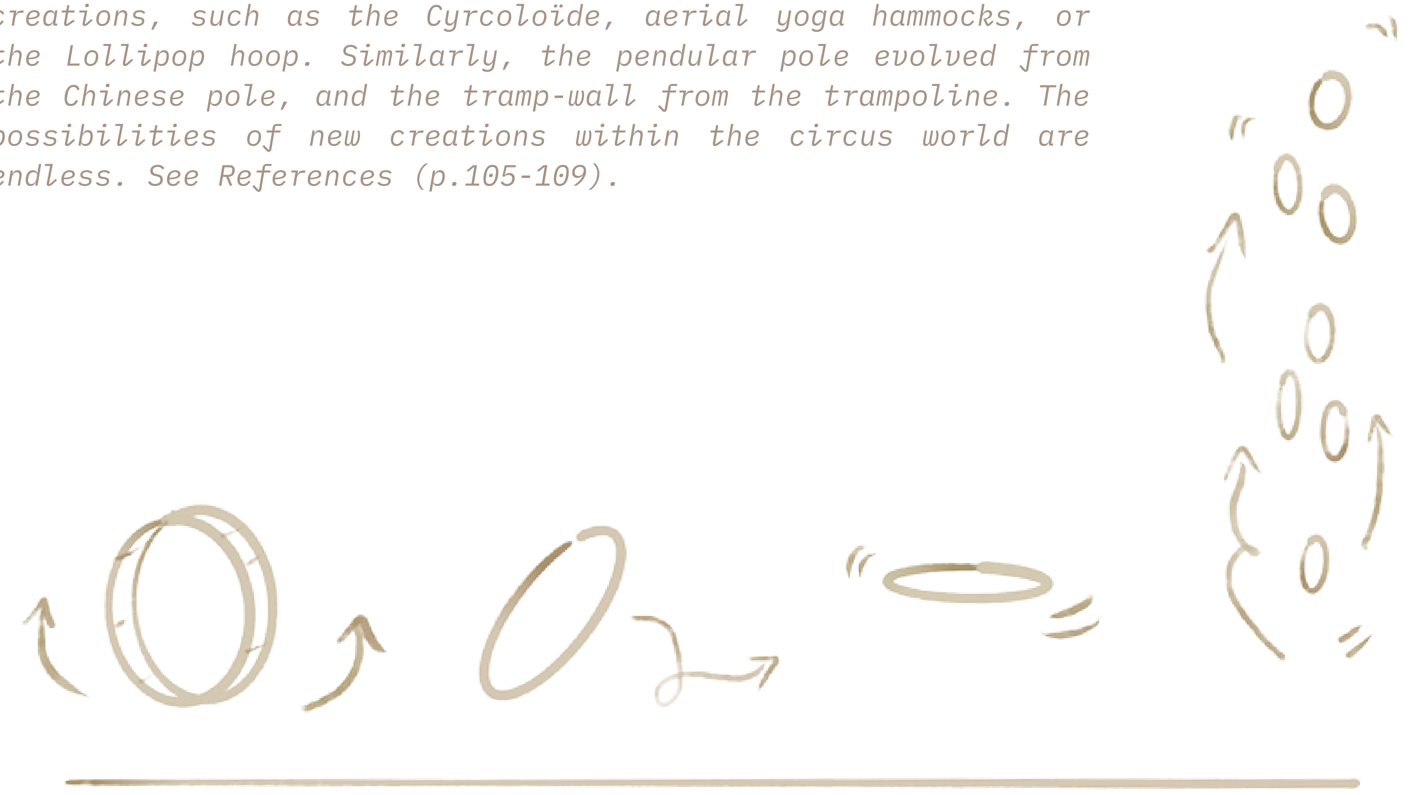
• **L'innovation** occurs when the invention finds its place within the community, whether that be on an individual, local, or collective scale. In other words, when it is shared, commercialized, or integrated into artistic or pedagogical practice.

Innovation implies some form of recognition—cultural, social, or economic: the use of the new object produces a change within the practice itself.

introduction & context

• When an innovation in apparatus design gains widespread popularity, it can gradually become established as a **new discipline**. This transition resembles a process of legitimization, whereby the innovation moves beyond its initial context, and is collectively adopted, taught, and reproduced within the community.

Examples such as the Cyr wheel, aerial silks, and aerial hoop illustrate how new apparatuses can emerge from questioning existing ones, and how they can eventually become recognized staples of the circus landscape. The original apparatus—once a new invention, now a discipline—can in turn inspire further creations, such as the Cyrcoloïde, aerial yoga hammocks, or the Lollipop hoop. Similarly, the pendular pole evolved from the Chinese pole, and the tramp-wall from the trampoline. The possibilities of new creations within the circus world are endless. See References (p.105-109).

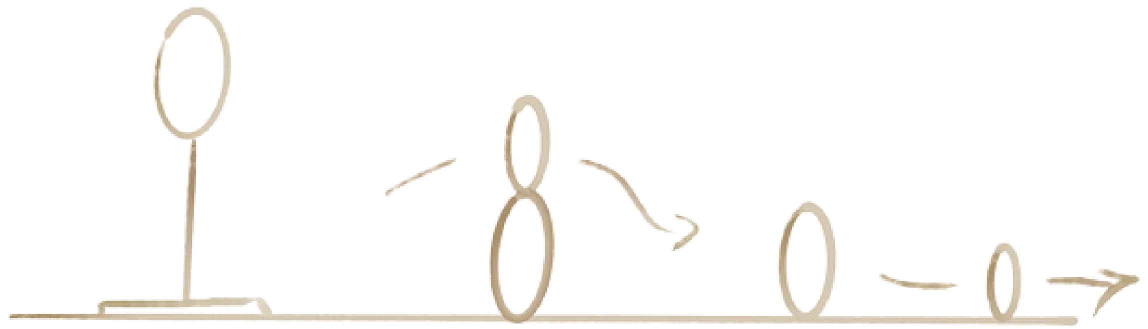


Phases and Iterations of the Design Process

Similarly, the phases of an equipment design project do not necessarily follow a linear progression. They vary according to the nature of the project and the specific challenges of each approach, within an iterative process.

Some steps may be skipped, revisited, or adjusted along the way. For the purposes of this guide, however, we have identified four main structuring phases that will organize the content of this document: ideation, design, fabrication, and appropriation. Our goal is not to offer a fixed formula for developing an apparatus, but rather to frame each of these key stages through the various sections of each chapter.

Before getting started, an important reminder: even when working as an individual artist, the design process is inherently a collective endeavor, where a wide range of skills intersect and complement one another. Thus, a design process involves synergy amongst the artists, designers, engineers, riggers, teachers, and others involved—and it should be recognized as such.



1.

Ideation

Where Does the Apparatus Come From?

1.1. An Idea Strikes

First of all, the purpose of this guide is not to tell you how to have ideas—this is your field of expertise as a creator. Ideas may emerge by day or night, in waking moments or in dreams, through images, feelings, or your own practice. In short, creative sparks are deeply personal and subjective experiences. However, we offer a few creativity techniques in the appendix, and share here some best-practice recommendations:

• **Never underestimate anything:** the most ordinary action can hold your moment of inspiration. Stay open and attentive to what passes through you.

• **Check whether your idea already exists:** before diving into a design process, take the time to research. If your idea already exists as you envisioned it, you can choose not to pursue it, to transform it completely, or to reinterpret it through your own distinctive form or creative language.

• **Avoid plagiarism:** if you draw inspiration from existing work, contact the individuals concerned and request their consent. Take an ethical stance, always acknowledge, cite, and respect the work and creativity of others.

• **Accept that an idea may not work:** this is part of the process and not necessarily negative; it helps train your creativity muscle.

In the interviews we conducted with representatives of circus companies, supplier-manufacturers, and acrobatic designers, several common sources of ideas were identified. Among them were: the desire to explore certain movements, inspiration from nature, videos of other artists, everyday objects or situations, and stage constraints.

Most participants mentioned that ideas often arise from an ongoing creative process, such as a dramaturgy that demands a scenography, or in other words, ideas that serve the performance or theme of the show. Conversely, it also happens that the show itself takes shape around the ideas.

Personal motivations—whether individual or collective—as well as the artists' desire to express a specific narrative or imaginative world, remain frequent driving forces behind the development of new apparatuses that achieves success.

If you wish to generate new ideas or push an existing one further, you'll find a collection of creativity methods and approaches in the Appendix: Approaches and Techniques of Creativity (p.112).

ideation

1.2. Pedagogy, Optimization, Adaptation

Beyond artistic goals, inspiration can also emerge through pedagogy, as equipment plays a fundamental role in the teaching of circus disciplines, and because the form and materiality of the equipment concretely determines what is physically possible. By extension, since the technique specific to each apparatus stems from its characteristics, the way equipment is designed directly influences how it is taught.

Moreover, pedagogical insights help explain the many technical and mechanical transformations that circus apparatuses have undergone over the years. The logic of optimizing and adapting physical work during training is therefore closely linked to that of designing, evolving, and adjusting equipment. If your development project falls within this perspective, we offer a few key considerations below.

• From a design standpoint, **optimization** is a process aimed at improving an apparatus or system to maximize the benefits of its use. It involves increasing efficiency, performance, and quality so that the outcome of its use approaches its full potential. A new design may, for instance, optimize time, safety, or physical effort.

• **Adaptation**, on the other hand, is a process aimed at adjusting an apparatus to the specific circumstances of its use, such as the individual bodies using it, the environments in which practice takes place, and the expected outcomes. A pedagogical adaptation involves modifying teaching methods to align learning demands with the learner's physical capacities. This adjustment can, in turn, inspire the design of equipment specifically tailored to pedagogical needs.

• The standard circus apparatus is typically designed for adult bodies engaged in professional practice—even though the same apparatus may be used, for example, by children in a recreational setting. This is one instance where adapting apparatus remains a promising area for research and development.

• Finally, since circus pedagogy is centered on the **human–equipment. relationship,** every innovation—whether it invents, optimizes, or adapts—should also prompt reflection from the human perspective. This represents an opportunity to strengthen the ethics of training, and to understand the importance of caring for oneself and for others within the context of a project; aspects that can and should be considered right from the design stage.

ideation

1.3. Developing the Idea

Let's imagine you've captured your idea. Now it's time to let it evolve. Here are a few questions to help refine your thinking and clarify both your idea and the uniqueness of your approach:

Relevance **:**
Does the idea address a problem or a need?
Is it consistent with the overall project, and with the project's context?

Performance **:**
What is the acrobatic or performative potential of this idea?
How could the concept be used by artists?

Originality **:**
Does the idea bring something new or unexpected?
How does the idea differ from similar examples?

Impact **:**
What is the added value, and who does it serve?
Can it transform practices, generate emotion, or lead to improvements?

Engagement **:**
Do you believe in the idea? Does your team support it?
Does it generate enthusiasm or curiosity?

You can also begin to conceptualize your idea by considering these questions:

Performance context :
What will the performance be?
What is the artistic vision?

Feasibility :
Can it be realized technically with the available resources (time, budget, skills)?
What resources do you already have? What needs to be acquired?
Are there major obstacles to its realization?

Performance venue :
Where will the work be presented?

Artists :
Who will take part in the creation? How many artists? What types of artists?

Touring and transport :
Is it a touring show? Will transport, setup, and teardown be involved?
If so, what type of transport will be required?

Some of these aspects are explored in greater depth in the section Design Criteria (p.44).

ideation

1.4. Making the Idea Explicit

Now that you've defined your idea, the next step is to articulate it so that you can share and communicate it with others. There is, however, no single formula for developing it further. For some, simply objectifying the idea is a developmental process itself, whereas for others, more concrete frameworks and milestones are necessary.

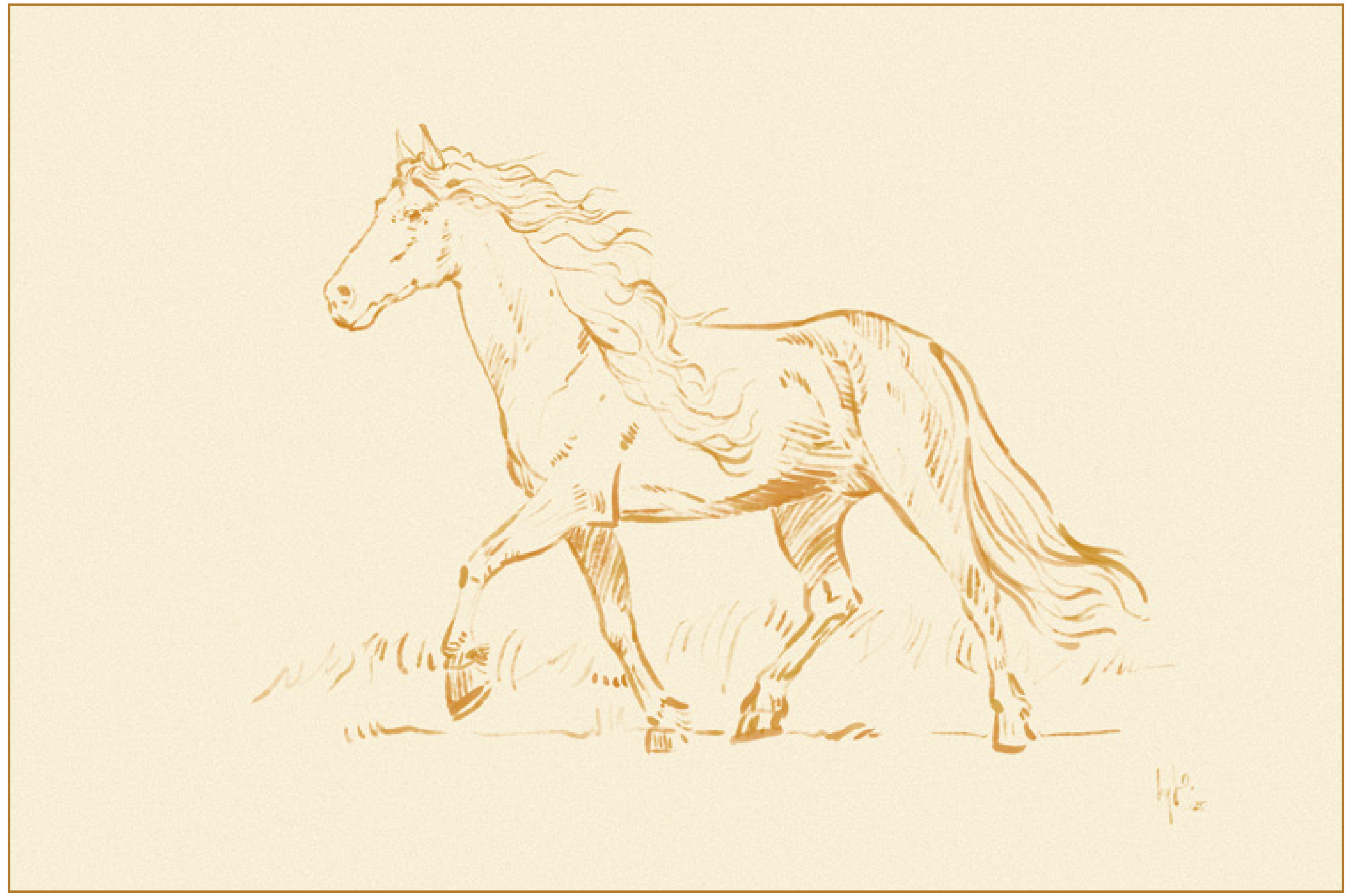
Some people prefer to talk about their still-fuzzy idea in order to refine their thinkings, while others have a clear view from the start, and are ready to jump into production. In any case, after the initial spark of inspiration, the next stage involves identifying a person or a team to begin the design process. This guide does not prescribe a single method but rather invites you to recognize the value of the diverse pathways that lead to the creation of an apparatus.

How you explain your idea is crucial to its potential existence, because a clear understanding by others is essential. Since everyone thinks differently, there's no guarantee that two people will visualize the same image from the same description. Likewise, someone else may not immediately grasp what you have in mind unless you communicate it clearly.

Let's illustrate this with an example:

Imagine a creature with four legs, a thin hairy tail, a long neck with a flowing mane, rounded hips, an arched back, pointed ears, a long friendly face, and slender ankles. One of its legs is bent, as if it were walking.

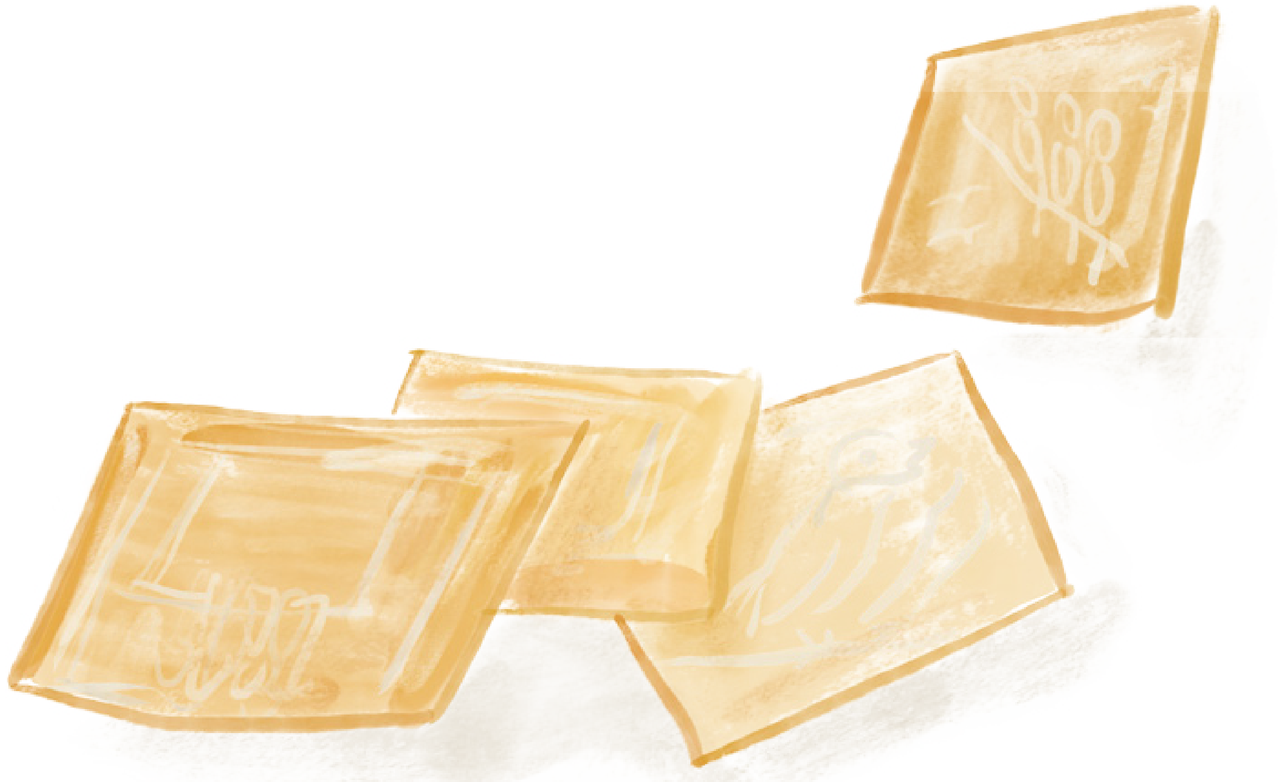
Did you picture *exactly* this horse?



Probably not. That's precisely why, when you have an idea, taking the time and making the effort to render it understandable to those you share it with makes all the difference. Make sure to communicate your idea as clearly as possible. In other words, make sure everyone is picturing the same horse.

Developing a pitch deck or presentation file is a key step in this process. Start by gathering images that nourish your idea—they can come from a variety of domains: toys, fashion, nature, etc.

The goal is to use these references to enrich your concept and anchor it within an aesthetic, an emotion, or a vision. Then, sketch the forms you imagine, combining the bodies and the envisioned apparatus.



Presentation File (Pitch Deck)

The purpose of this document is to strengthen your commitment to your concept, mobilize and energize your support network, and clarify your needs. A good presentation file should also include visual material to communicate your ideas as faithfully as possible to what you have in mind, both artistically and technically. Visual aids can take many forms and should be adapted to context (technical team, funding application, etc.).

The visual material should ideally result from your preliminary research. For example, if your apparatus project is inspired by an existing object, now is the time to research the different design variations that may exist. More broadly, observing how similar concepts have previously been materialized by others can help deepen your reflection and enrich your proposal. Above all, take the time to identify what makes your approach unique. This distinctiveness will give your project its strength and originality—both artistically and technically—and will make it easier for others to visualize.

In general, sketches of the apparatus (both in isolation and in use), combined with a series of reference images (e.g., sources of inspiration), form a good starting point. This allows for an initial visualization of the technical structure of the object, its use in performance, and the creative universe in which the project takes shape. Exploring several versions or configurations will help open discussions with designers and better guide the development of your ideas.

To support the communication of your idea, your presentation file could be structured as follows:

- **Summary of the Idea and Genesis of the Concept**
  Briefly explain your idea and the thought process that led you to it.

- **Comparison with Existing Devices and Justification of its Relevance**
  Indicate what your concept can be compared to and why it represents an improvement. (For example: "It's similar to aerial straps, but better suited to small spaces.")

- **Series of Pages Illustrating What You Know Is Feasible**
  Present sketches accompanied by clear descriptions showing confirmed uses of the apparatus and how you envision using it.

- **Association of Sketches with Inspirational Images**
  It may be helpful to pair your sketches with images that add color and emotional resonance for the viewer. (For instance, for a new concept of a swinging pole, you might draw inspiration from seagrass; for a trampoline-on-stilts invention, you might aim to mimic the world of insects.)

- **Series of Pages Illustrating What You Think Is Feasible**
  Present elements you believe are possible, along with sketches, descriptions, and inspirational images.

• **Definition of Questions to Be Resolved**
In this section, identify the questions that need to be clarified to move elements from "potential" to "confirmed."

• **Detail Your Needs**
Exemples :

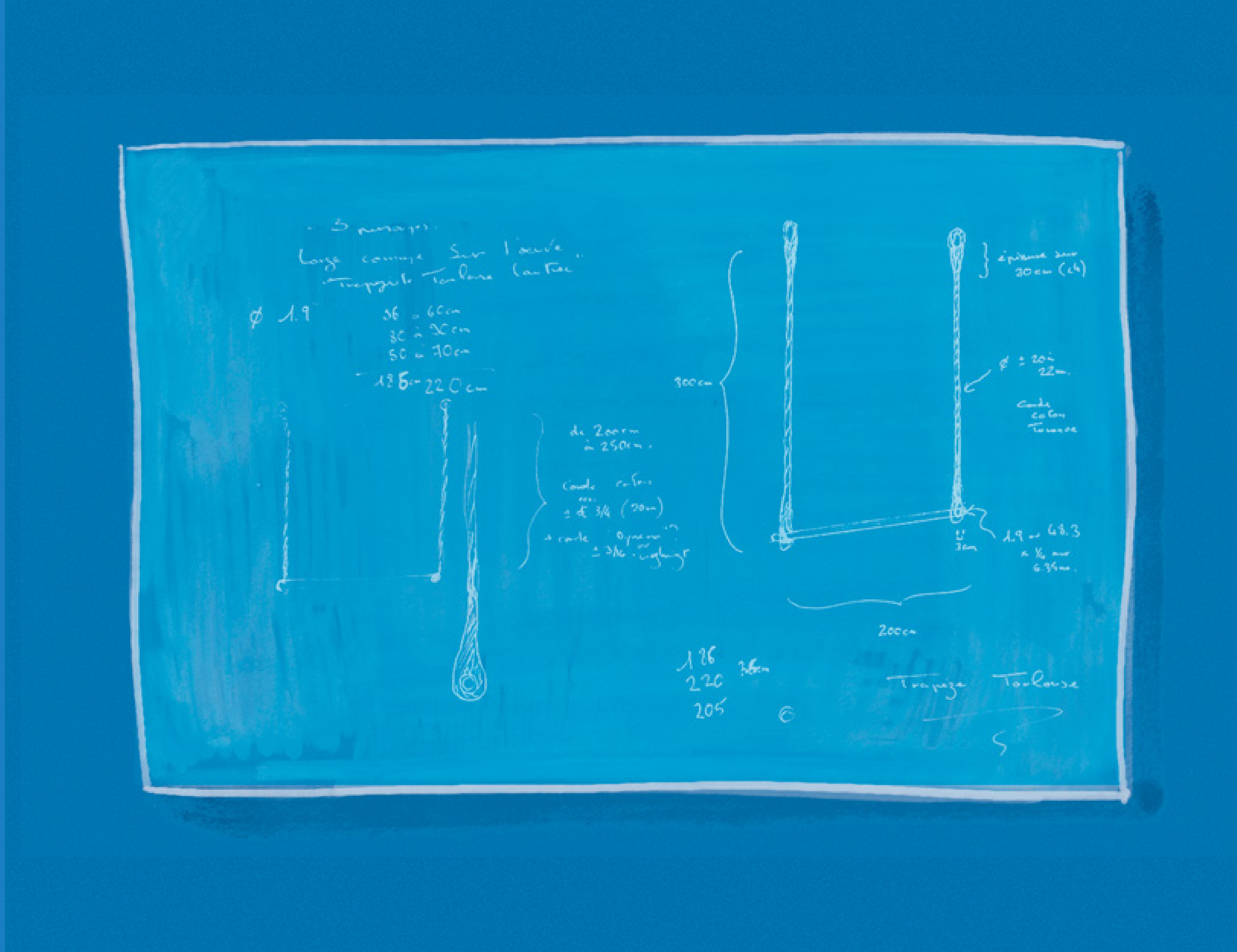
– I need to manufacture [your project]. To do this, I require technical assistance for the design and fabrication of the apparatus.
– I need help and collaboration to create a small-scale prototype in order to observe its behavior in relation to [aspects to be tested]. Once these parameters are validated, I will move on to a full-scale prototype.
– I have a full-scale prototype and need [number of hours] of private exploration time with a coach to develop acrobatic content, as well as a technician to handle the apparatus.

You can also start reflecting on intellectual property considerations (see section Intellectual Property, p. XX) to define your approach at this stage of the project. It is generally advisable to protect your images (for example, **©YourName** + **year**) and to have a non-disclosure agreement (NDA) signed before meeting with a company.

2.

Design

What Form, and Why?



2.1. Preparing Your Project

At this point, you've conducted your research, your idea is well defined, and you can communicate it clearly. The following section presents key elements related to design project management to help you avoid setbacks and obstacles that may arise without a well-structured roadmap.

Cost–Quality–Time Considerations

How would you like your apparatus to be? In an ideal world: ready now, of high quality, and inexpensive. However, in reality, the design of a circus apparatus often requires the collaboration of multiple experts—designers, engineers, fabricators, and others. In addition, procurement timelines can be long, as can the processing of funding applications when applicable. Designing a new apparatus is therefore a project that must be coordinated and managed.

Using the example of the project management triangle proposed by Barnes (1969), we can consider cost, time, and quality as dynamic constraints that shape a project's feasibility, between which an appropriate balance must be found. In other words, a project's success depends on the ability to make choices and trade-offs among these criteria. For example:

• **If you want a project that is inexpensive and completed quickly, the result may not reach the desired level of quality.**

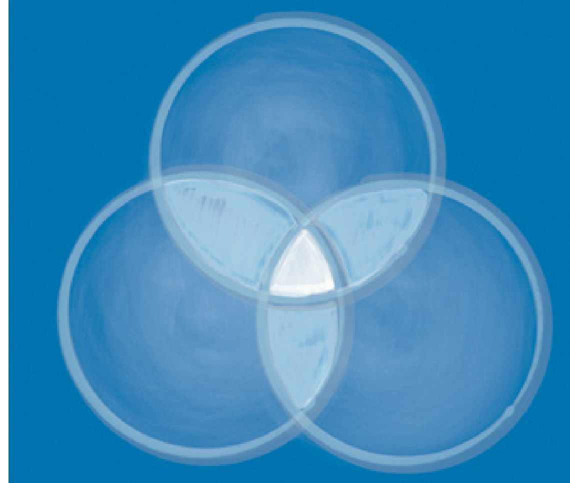
• **If you aim for a project that is inexpensive and high-quality, the process will likely be long and slow.**

• **If you want a fast process with a high-quality result, the cost will be significantly higher.**

Beyond these three classical criteria, one can also consider the relationships between scope, cost, and time (the "deliverable triangle"), or between quality, risk, and resources (the "process triangle"). Many other dimensions may come into play: performance, people, environment, profit, control, and benefits—all of which should be considered depending on the nature of your project.

It's also important to understand that designing an original apparatus involves a one-of-a-kind fabrication process. This means producing a unique, locally made prototype, unlike mass-produced, commercially available equipment. Consequently, costs are typically higher; a reality that is unavoidable when it comes to custom and artisanal fabrication.

Even before seeking funding for a design project, it's best to plan for more than your initial estimates, both in time and budget. The production process inherently involves risk and uncertainty, which are difficult to anticipate, since every project is unique. For this reason, timelines can extend and costs may rise along the way. As a general rule, it's better to build in a generous margin than to risk falling short.



Finding Funding

To our knowledge, there are currently no grant programs specifically dedicated to the fabrication of acrobatic apparatuses. However, it is possible to include the development of a new apparatus within a funded creative project, provided that it occupies a central place in the project and that its relevance is clearly demonstrated.

In Québec, the main funding bodies—CALQ (Conseil des arts et des lettres du Québec), CAM (Conseil des arts de Montréal), and CAC (Canada Council for the Arts)—offer research and creation programs. These programs, intended for professional artists and companies working in the arts, can be used to finance elements related to prototype development, acrobatic research, and/or artistic creation. Naturally, there are also other funding agencies and co-producers outside Québec and internationally. On this topic, we encourage you to explore the cultural ecosystem surrounding your project to identify the resources and opportunities that could support it.

More rarely, research or research-creation funding within academic settings can partially cover costs related to the design of acrobatic equipment, particularly when such equipment is essential to the project's scientific or artistic objectives, or when it represents an innovation. In such cases, organizations such as FRQ (Fonds de recherche du Québec), SSHRC (Social Sciences and Humanities Research Council of Canada), NSERC (Natural Sciences and Engineering Research Council of Canada), Canada Research Chairs, or various research centres may offer financial support.

If you are an artist, it is generally necessary to partner with a university or research centre (such as the HUPR centre) to access these funds, since such grants are typically reserved for individuals working in applied or academic research. These collaborations can create valuable opportunities for exchange, both artistic and scientific.

Finally, self-financing remains a common path for artists and companies, both small and large, wishing to develop their own apparatus. This may take the form of personal income, private partnerships, or fundraising campaigns, depending on the resources and objectives of those leading the project.

Required Resources

Depending on the complexity of your project, you may need the following areas of expertise:

• **Acrobatic Equipment Design:** Responsible for the creation and development of the circus apparatus.

• **Industrial Design:** Carries out the conceptual design of the equipment. The industrial designer may also produce sketches, 2D drawings, and 3D models to visualize ideas.

• **Technical Drafting (Industrial Drawing):** Produces the technical drawings required for the fabrication of the prototype.

• **Engineering (Mechanical):** Performs load calculations, material strength analysis, anchor point evaluations, etc.

• **Prototyping and Fabrication:** Expertise in the fabrication of components such as welding, machining, and working with metal, wood, composite, or other materials.

• **Rigging:** Responsible for installation, verification, adjustment, and inspection of equipment. Some riggers also participate in equipment design.

• **Mechatronics:** For projects involving motorized systems, lighting, or sensors.

• **Project Coordination**: Planning, organizing, and managing project activities and ensuring smooth progress.

This list of expertise is not exhaustive. Depending on the nature of your project, some of these skills, or even all of them, may not be necessary, while other areas of expertise might be relevant.

We recommend working with professionals who have a solid understanding of circus disciplines or performing arts contexts (for example, touring constraints, dynamic movements, or performance environments). It is also essential that they understand the artistic requirements of your project, since your equipment development is part of a creative process. If you have doubts or are not fully satisfied with a proposed service, do not hesitate to consult other experts for a second opinion or recommendations. It is far better to gather diverse perspectives early on than to end up with faulty or unsuitable equipment at the time of performance.

2.2. Design Criteria

This section outlines the fundamental criteria guiding the design of a new apparatus, aiming to ensure a composition that is safe for use and optimized for longevity. Safety, of course, is the overarching principle that should guide every decision related to design criteria. We encourage you to take it into account right from the beginning of your project.

Transportability

If the apparatus is intended to be mobile or used on tour, it is essential to understand the conditions under which it will travel—both geographically (regional, national, international) and materially (in a road case, as luggage, etc.). At this stage, it is useful to consider the relationship between the design of the apparatus and its transport requirements, as these can directly influence many technical choices.

For example, a trapeze bar measuring 170 cm in length can fit in a ski bag and be transported by plane, so it does not need to be disassembled into multiple pieces, unlike a Cyr wheel. It is therefore important to account for the balance between weight and volume when traveling by air, as well as the constraints of road transport, including container door dimensions, which vary depending on regional regulations. The same applies to power standards if your project involves automation. See section Designing Your Project File, (p.48).

Sometimes, it can even be interesting to think about how the mode of transport can become an integral part of the apparatus itself. For example, a road case (also called a flight case or transport case) might transform into a functional part of the apparatus system, serving as a counterweight or a base for balance. In short, the way the apparatus is transported will shape its form, structure, aesthetics, and the time required for setup.

Strenght

The apparatus must be built with enough precision and rigor to avoid any type of breakage, excessive deformation (for rigid equipment), or other defects that could compromise the acrobat's safety. Several notions are important here. Rigidity, the resistance to deformation. Elasticity, or the ability to return to the original shape after deformation. Deformation, which is the change in shape or dimensions of an object under load.

For example, elastic apparatuses like aerial silks are designed to deform under load and then return to their initial shape. Conversely, rigid apparatuses like a trapeze bar or a Cyr wheel are designed to maintain their shape despite applied loads. In both cases, the equipment must be able to withstand forces without breaking. A structural analysis performed by an engineer verifies the integrity of the apparatus in terms of rigidity, elasticity, and deformation under load. See Structural Analysis (Engineer), (p. 62) , and Risk Analysis(p.65).

Mechanical Performance

Depending on the mechanical forces acting on the apparatus, its resistance must be carefully considered. Each material and technical element in a project has its own strength characteristics, and the goal is to find an optimal balance between the elements, structure, materials, and their function. Material stretching and degradation should be anticipated as early as the design phase.

Combined with the type and frequency of use, these factors determine both the lifespan of the apparatus and the inspection or maintenance frequency required. For example, a bungee cord or a safety net has both a break-in period and a decay phase. Regular inspection and replacement schedules must therefore be planned and integrated into the project's timeline and budget.

Durability

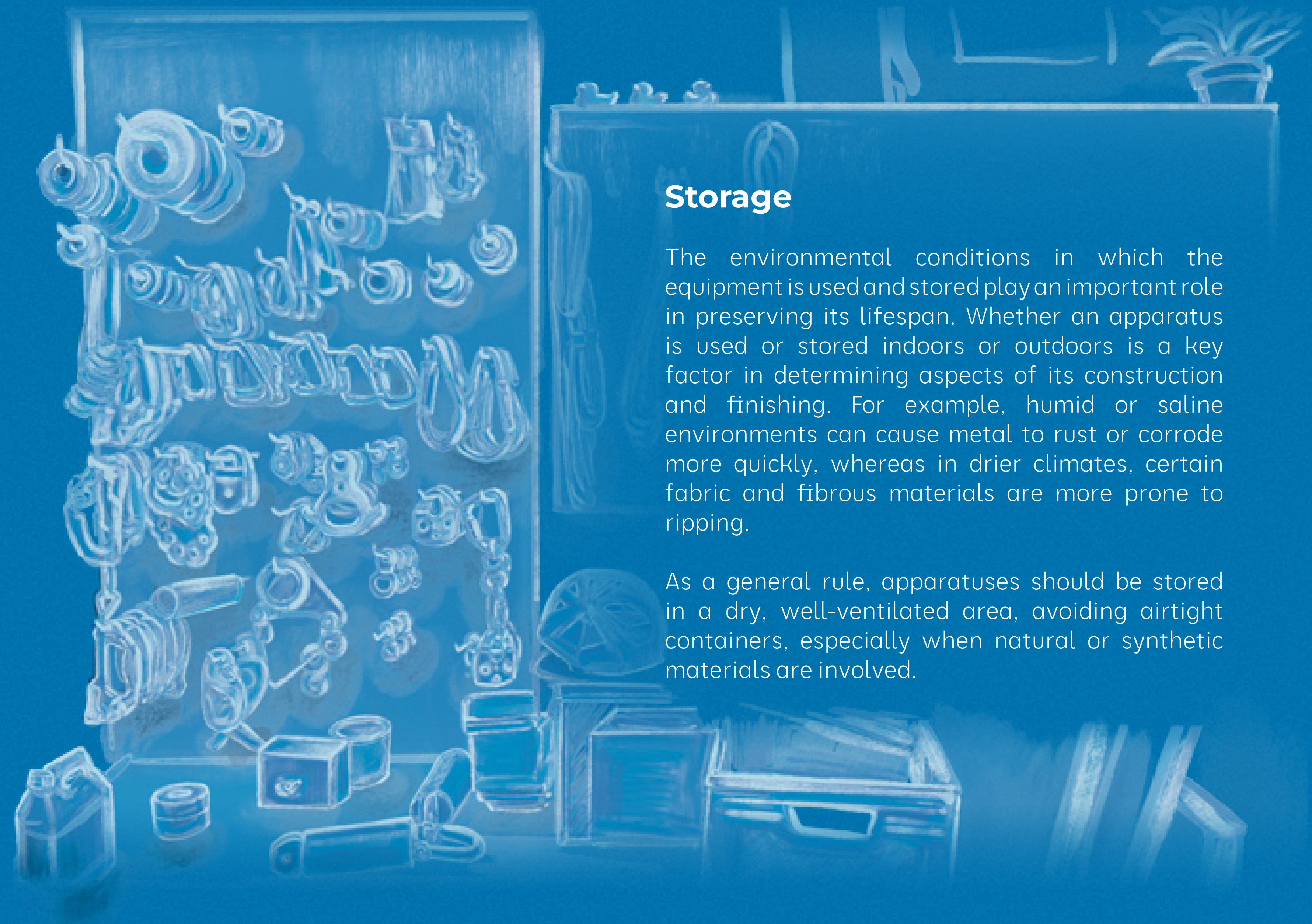
The durability of an apparatus encompasses both its longevity and its operational capacity. At this stage, it is useful to define the expected frequency of use. For instance, an apparatus designed for a single event will experience much less wear than one used in 4,000 performances of the same show. Durability depends on the quality of assembly and materials, whilst also taking into account both static forces and anticipated dynamic factors. However, it is normal for some of these calculations to remain approximate at this stage.

The type of wear varies with the intended use: For occasional use, wear is generally minimal. For removable structures, it is the repeated assembly and disassembly cycles that damage materials more than actual performance use. For permanent shows, wear primarily results from continuous usage.

Finishing

Finishing refers to the surface qualities of the apparatus. This includes the patina, color, and texture, which may serve both technical purposes (for example, preventing a bar from slipping by covering it with tape) and aesthetic ones (for example, choosing a color that aligns with the visual universe of a performance).

This is the stage where material qualities, surface treatments, and visibility are considered in relation to the artistic intentions of the creation.



Storage

The environmental conditions in which the equipment is used and stored play an important role in preserving its lifespan. Whether an apparatus is used or stored indoors or outdoors is a key factor in determining aspects of its construction and finishing. For example, humid or saline environments can cause metal to rust or corrode more quickly, whereas in drier climates, certain fabric and fibrous materials are more prone to ripping.

As a general rule, apparatuses should be stored in a dry, well-ventilated area, avoiding airtight containers, especially when natural or synthetic materials are involved.

2.3. From idea to project

Once the design criteria has been clarified, the next step is to transform your idea into an apparatus design project. This means defining your objectives and identifying the resources you have in order to turn the abstract idea into a tangible one.

At this stage, a solid design project must begin by addressing a series of technical and mechanical questions, which will determine the development of two key documents: the budget and the timeline.

A clear budget provides an overview of the projected costs and potential financial resources available for the project, while a realistic timeline anchors the various stages within a concrete schedule, taking into account the time implications of each step.

Because these two aspects determine the scope and feasibility of the design project, they correspond to the "cost" and "time" vertices of the project management triangle introduced earlier. We recommend developing these documents together, as this will help maintain an awareness of how the two are intertwined throughout the project.

Naturally, since early versions of these documents are rarely the final ones, your budget and timeline should both result from and respond to the following preliminary questions.

Technical questions

1. When must the apparatus be ready?

Having a precise date for public presentation is essential for effective scheduling and realistic planning. This date determines the delivery deadline for the apparatus, allowing sufficient time for technical validation, familiarization and training, and artistic creation.

By treating the delivery date as the final (non-negotiable) point of the project, you can position key milestones backwards in time, corresponding to the major tasks that must be completed before that deadline. This approach follows the logic of reverse project planning (or retroplanning).

2. How much funding do you have to develop the apparatus?

The project's overall budget will be decisive in guiding the choices you make, such as the selection of materials, fabrication procedures, the scale of the rigging system, or the number of components. The budget will also influence the project's pace, since accelerating stages inevitably increases costs. Finally, the budget serves to fairly value the work of everyone involved.

Keep in mind that creativity does not always require abundant financial resources—ingenuity often thrives within constraints.

Technical questions

3. What means of transport are planned for the apparatus?

If the new equipment must be transported by air, it is necessary to comply with standard maximum dimensions established by airlines. These are the current restrictions according to the International Air Transport Association (IATA):

• **Carry-on baggage:** 56 cm (22 in) × 45 cm (18 in) × 25 cm (10 in), with a maximum weight of 5 kg (11 lb).

• **Checked baggage:** Total dimensions (length + width + height) not exceeding 158 cm, with a maximum weight of 23 kg (50 lb).

• **Oversized checked baggage:** Length exceeding 180 cm.

• **Cargo transport:** Maximum dimensions vary depending on the mode of transport.

Note that these limitations may differ between airlines, so it is always recommended to verify current airline regulations before finalizing your design.

Usage Questions

1. For how many people is the apparatus designed, and what type of movement is envisioned?

The number of artists using the apparatus at one time will determine the materials necessary for its production, and the maximum load capacity that the apparatus has. It is important to consider the individuals on the apparatus, but also the activities that they will be doing. Are the movements soft or dynamic? Is the apparatus static (fixed), swinging, or rotating? Does it change height/shift within the space?

The number of users and types of movement planned on the apparatus will determine how loads are distributed across the object and its system, thereby influencing material selection during design. This is the stage where you should begin to set priorities, if necessary. For example, is the height of the apparatus more important than its ability to rotate?

Making these choices early helps prevent the breakage or deformation of an apparatus designed for one person but used by several simultaneously. Conversely, if six artists are anticipated but the apparatus ends up being used for a solo act, it may become unnecessarily large, heavy, and difficult to transport.

When designing the prototype, focusing on efficiency and simplicity facilitates technical decisions and helps reduce the risk of unnecessary complications.

2.4. Budget and Timeline

An important note during project planning: meetings, site visits, quotes, information gathering, or drawing production—all of these represent working hours for equipment designers or project managers and therefore must be included in the budget.

The budget and timeline are, of course, flexible documents, created and adjusted throughout the course of the project. They cover the planning, monitoring, and management of the available funds, as well as the project's different stages.

You are free to choose the budget and scheduling model that best fits your project and working style. The purpose of this section is not to prescribe a specific template, but rather to highlight key elements to include, along with a few practical tips to help you avoid complications.

To Include in the Budget

Essential:

• **The working hours of everyone involved** (designers, engineers, fabricators, consultants, advisors, artists, etc.);

• **Materials, including products and quantities, as well as shipping or customs fees if applicable;**

• **Rental costs for rehearsal or testing spaces** (for trials, acrobatic validation, exploration time, rehearsals, etc.);

• **Travel and transportation costs for equipment or materials.**

Recommended :

• A tracking tool showing the relationship between expenses and remaining funds, expressed in both percentage and numerical terms, to enable more precise project monitoring throughout the process;

• A contingency percentage for unforeseen expenses, usually estimated between 10% and 30%.

To Include in the Timeline

Essential :

• **A Gantt-style calendar, with clear time divisions for each phase**—by year, month, or week, depending on the project's needs;

• **Project stages detailing the specific tasks;**

• **Start and delivery dates for each task.**

Recommended :

• Status of each stage, to ensure more precise project tracking;

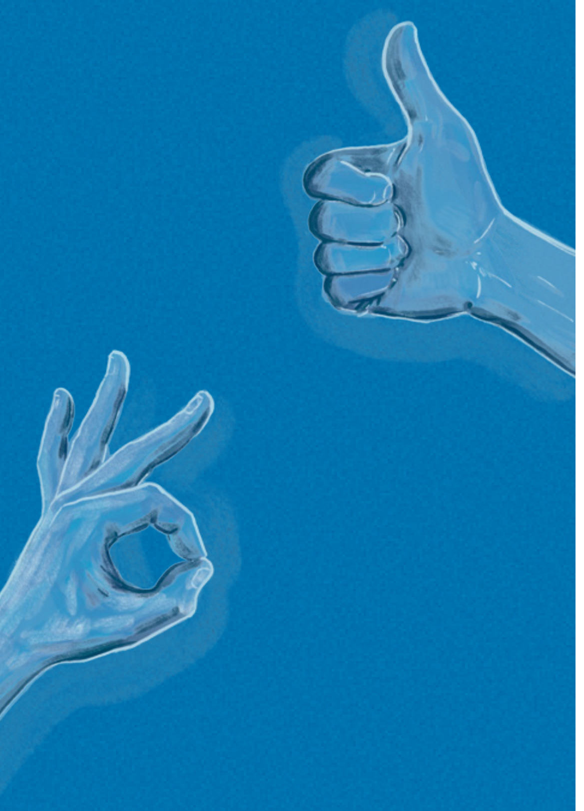
• People involved in each stage;

• Specific characteristics of each step;

•Interdependence between certain stages (for example: Step A must be completed before Step B can begin);

• Deliverable(s) expected at each stage.

• Include from the outset iterations or adjustments to the prototype, as the first version will likely require improvements or modifications. (See Multiple Versions, p. XX.) (p.89).



A Few Tips

• **Keeping the budget and timeline in the same document** allows for efficient parallel tracking, for example, by using two tabs in a single Excel file.

• **Ask a peer or expert to review the document to ensure logic and clarity,** both in terms of writing quality and consistency of ideas, particularly between the budget and the timeline.

• **Pay attention to presentation:** especially if the document accompanies a funding application. Form matters just as much as content.

2.5. Design Phases

Now that you have an idea for a new piece of circus equipment, as well as a structured outline of the projected processes necessary for development, the next step is to move into its design phase, which unfolds through the following stages:

a) First meeting (artist and design team)

b) Analysis (design team)

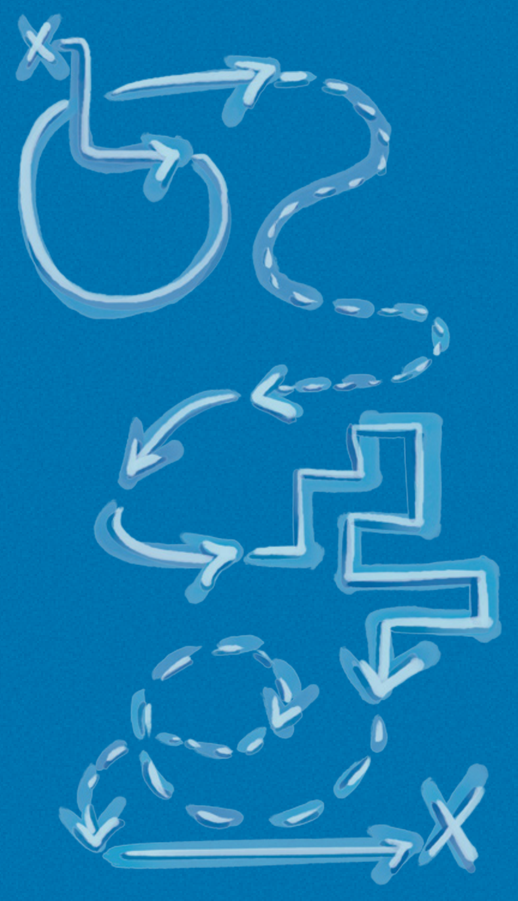
c) Initial consultation (artist and design team)

d) Initial consultation (design team and workshop/artisan)

e) Technical drawing (technical drafter)

f) Structural analysis (engineer)

Since this is an iterative process, as mentioned earlier, these steps are not necessarily followed in a linear order. Each of these stages is detailed on the following pages.



a) **First meeting** (Artist and Design Team)

During this initial meeting, the artist or artistic team generally presents the idea for the new equipment and the overall project to the design team. (See Presentation File (p. 32) and Required Resources (p. 42), for the list of relevant expertise.

The design team can be an independent team, for example, an acrobatic designer or a project manager, or it may be an internal team within a fabrication workshop. In some cases, the acrobatic designer or project manager assembles the required expertise (such as a drafter or an engineer), while in others, the artist themselves may form their own team. Certain companies also have all the necessary skills in-house and can therefore build their own integrated design team. It should be noted that, depending on the project's scope, a design team may consist of a single person.

At this meeting, it is best to already have a somewhat defined idea of certain aspects—such as the design criteria, budget, schedule, and visual references—although the design team can also assist in defining these parameters.

b) **Analysis** (design team)

Next, the design team conducts an initial analysis phase to define the following elements:

• **Preliminary design estimate:** an initial assessment of technical needs and the main features of the equipment. Feasibility and available resources are also evaluated.

• **Visual research:** if the artistic team has not provided visual material, the design team may gather references, create moodboards, or produce hand-drawn sketches.

• **Context analysis:** the usage context is identified or refined—environment, number of users, conditions, and types of loads—to better understand needs and constraints.

• **Sketches, models, videos:** the team may create visual or physical representations, such as scale models, to confirm understanding of the equipment and/or test specific situations.

• **Preliminary 2D or 3D design:** early 2D or 3D modeling, including dimensions, helps verify constraints and validate proportions or interactions between parts.

• **Budget and schedule estimates:** cost distribution and project timelines are defined.

• **Specifications document:** a technical brief is prepared by the design team in collaboration with the artistic team. It outlines needs, objectives, constraints, and project-specific details.

• **Development:** multiple equipment options or project scenarios may be defined, allowing flexibility in direction depending on intermediate results.

• **Risk analysis:** identification of technical, financial, or other risks should be performed early to anticipate mitigation measures and avoid future costs. See Risk Analysis (p.65)

• **Concept refinement:** the concept is progressively improved through ongoing reflection and discussion.

Not all of these elements are mandatory, and they should be adapted according to the scale and nature of each project.

c) Initial Consultation (Artist and Design Team)

Following their analysis, the design team meets with the artistic team to ensure that both visions and project objectives are aligned.

The presentation of these steps in the first few phases does not need to be strictly linear, as future consultations should take place before all elements are finalized. The number and frequency of exchanges between the design and artistic teams will vary greatly depending on the project.

At the end of these consultations, the design and artistic teams must agree on all aspects of the project. It is essential that both teams ensure the equipment meets the artists' needs and constraints, production and touring requirements, and all safety standards. At this stage, the teams may also decide not to move forward with the project due to a lack of funding or feasibility concerns.

d) Initial Consultation
(Design Team and Workshop/Artisan)

Once the equipment concept is clearly defined, it's time to identify one or more fabrication workshops capable of bringing the prototype to life. Depending on the project, several areas of expertise may be required. The design team may need to contact multiple workshops, either to request several quotes or to ensure that the chosen workshop meets the necessary requirements. In some cases, the design team might also consult workshops or artisans earlier, during the analysis phase, to verify fabrication feasibility or to estimate manufacturing costs.

During this meeting, the design team brings materials such as the technical brief (cahier des charges), 2D or 3D design models (if available), drawings, schematics, mock-ups, or any other element that may help the workshop or artisan fully understand what is being requested. It is important to validate and discuss with the artisans or workshops the technical feasibility of fabrication, potential design or production optimizations, as well as key project parameters such as delivery deadlines or the types of plans required.

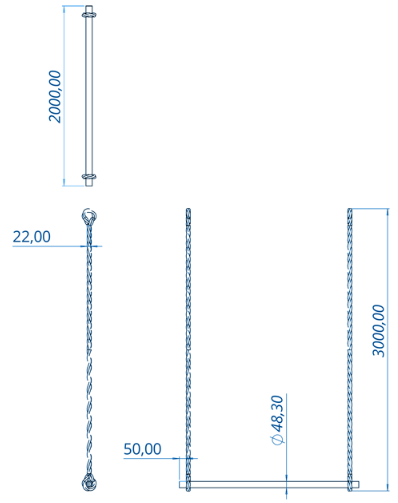
After this consultation, the workshop or artisan(s) provides a service proposal. Different options may be offered—for example, a budget version or a premium version of the prototype—to compare costs and project scope.

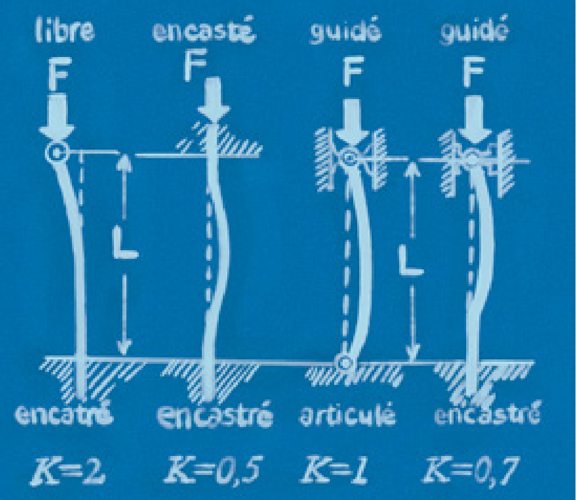
e) Technical Drawing (Technical Drawing expert)

A technical drawing is a standardized graphic representation showing the shape, dimensions, and characteristics of the equipment. There are several types of drawings, such as section views or perspective drawings. Technical drawings are often produced in preliminary form. It is recommended to have these drawings validated by the artistic team before moving to the next stage.

A manufacturing plan is a more advanced version, created according to industrial drawing standards. These plans are essential for the artisan or fabrication workshop to build the apparatus. They include, among other details, dimensions and tolerances, materials to be used, and assembly instructions. Sometimes, the artisan or workshop can produce these plans from the technical drawings—this should be clarified during the consultation stage.

Common software used for technical and manufacturing drawings includes SolidWorks, CATIA, and AutoCAD. It is also possible to have these drawings and/or manufacturing plans ready before the consultation with the artisan or workshop (the previous step), to facilitate the discussion.





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f) Structural Analysis (Engineer)

Structural analysis involves evaluating the strength and stability of the equipment to ensure it can safely support loads, thereby guaranteeing the safety of both the individuals and equipment involved.

When to Consult an Engineer? In Québec, the Engineers Act (Loi sur les ingénieurs, RLRQ, chapter I-9) defines the activities reserved for the engineering profession. Only members of the Ordre des ingénieurs du Québec (OIQ) are authorized to use the title Engineer in Québec. When a piece of equipment, such as a circus apparatus, supports human loads or presents a risk to people or property, it may be necessary to obtain an engineer's seal. This seal validates the strength of the designed equipment, certifies that it complies with applicable standards, and provides an official document that may be required by technical directors or venue safety managers. It is recommended to contact an engineer early in the process to quickly determine whether a structural analysis will be required and to estimate the associated costs. Whenever possible, seek an engineer with experience in circus arts or, failing that, in performing arts.

The first step is to identify the loading cases that will affect the equipment, such as the forces, locations, temperatures, and overall surrounding conditions. This must be done collaboratively between: the artistic team, which defines performance and production needs; the design team, which specifies environmental conditions, user profiles, and modes of use; and the engineer, who translates this information into applied forces and moments on the equipment.

Key parameters to consider: indoor/outdoor use, temperature, humidity, wind, sun exposure, number of performers, type of performance or movement, static or dynamic use, suspension, impact, and assembly/disassembly cycles.

Several calculation methods may be used by an engineer:

• **Analytical calculations:** use material strength formulas suitable for simple loading cases.

•**Finite Element Analysis (FEA):** software such as ANSYS or SolidWorks can simulate the structure and compute stresses and deformations for complex geometries or multiple loads.

• **Physical testing (destructive or non-destructive):** load tests following rigorous protocols can complement or validate calculations when uncertainties remain. These are acceptable provided they are well-documented, measured, and supervised by a qualified professional.

• **Reference to existing designs:** if similar equipment has already demonstrated sufficient strength, recalculations may not be required—provided there are no major differences in design or use.

Following the engineer's analysis, adjustments may be required to the geometry, material thickness, materials, or assembly methods to ensure resistance under load. The manufacturing plans must then be updated accordingly.

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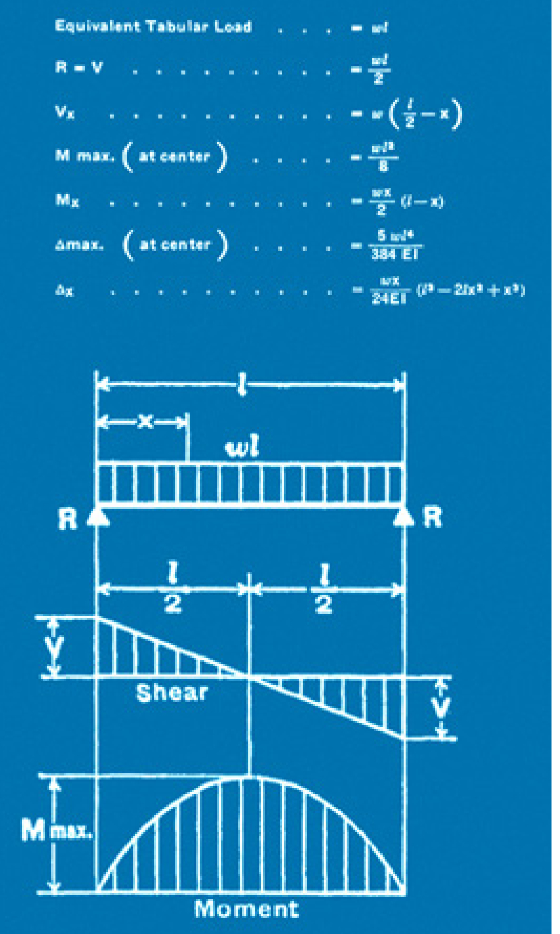


Important Points When Working with an Engineer :

• The engineer must be able to justify all reasoning and assumptions used in the calculations. We recommend reviewing and validating these parameters to ensure the analysis accurately reflects real usage conditions.

• There should be complete traceability of all calculations, tests, and validation methods. The engineer must provide a detailed report describing the assumptions, loading cases, methods used, and results obtained.

• Discuss whether fatigue effects, impacts, wear, or exceptional loads need to be considered.

• Define the appropriate safety factor based on the type of use (static vs. dynamic).

• The engineer's seal entails professional and legal responsibility, so it is crucial for the design and artistic teams to supply precise and complete data.

Finally, at this or any earlier stage, it is always possible that the teams decide not to proceed with the project due to insufficient funding or feasibility concerns.

2.6. Risk Analysis

Risk management is an essential component in the design and use of circus equipment, as it aims to prevent accidents, protect the health of artists, and ensure public safety. It is especially important when developing new equipment, as there is a certain degree of uncertainty that requires careful reflection on potential risks.

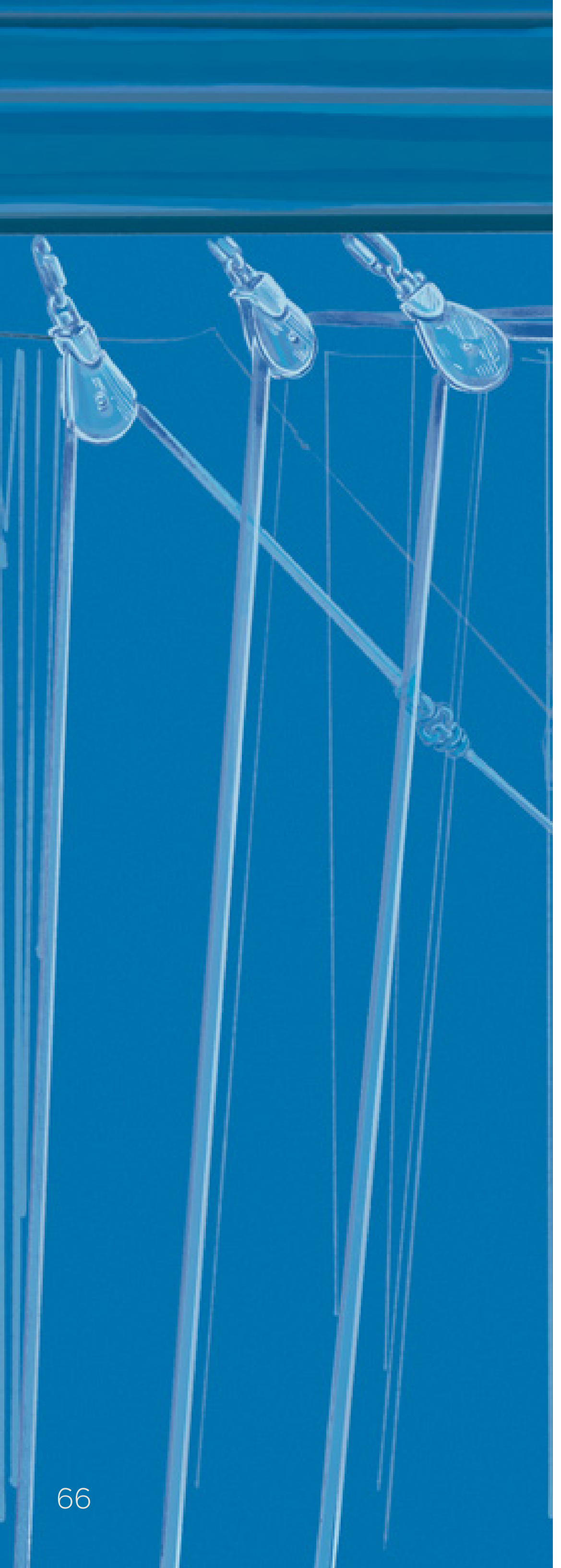
However, this process takes place after the ideation phase—its purpose is to enable the safe realization of your idea, not to limit its creative scope. Risk management is multifactorial, meaning that risks can arise from multiple sources:

• **Individual risks:** physical or psychological condition of the artist or team (fatigue, stress, etc.);

• **Team risks:** supervision, communication, collaboration, etc.;

• **Organizational risks:** management, safety culture, working conditions, environment, etc.;

• **External risks:** suppliers, partners, legislation, international or societal standards, cultural context, etc.



Fundamental Principles

Prevention First

The primary goal of this analysis is to prevent risks from the very beginning of the design phase. However, it is not always possible to eliminate risks entirely. In such cases, they should be reduced as much as possible and appropriate mitigation measures should be implemented.

Prevention Through Design

Prevention should be integrated from the earliest stages of developing a new piece of equipment. It is recommended to involve all stakeholders—designers, artists, technicians, and managers—from the start of the project to conduct a risk analysis. All health and safety policies and practices should be clearly communicated to all staff, artists, and suppliers.

Ongoing Prevention

Safety practices, equipment, and policies must evolve continuously throughout the process, adapting to new experiences and knowledge along the way. It is important to regularly question the relevance of existing safety practices and update them as needed.

Key Definitions

The concepts of risk and hazard are often confused. Let's clarify this distinction: Risk refers to the probability that a person will suffer harm or adverse health effects when exposed to a hazard. A hazard, on the other hand, refers to any potential source of harm, damage, or adverse effect that may impact a person or an object.

Risk = Probability (Frequency) × Severity (Magnitude of Consequence)

General Best Practices

Implementing rigorous safety measures is a fundamental requirement in the design and use of circus equipment.

This involves conducting regular inspections of apparatuses, rigging, and work surfaces, as well as systematically verifying load capacities, particularly for anchors and technical devices. All operations must be traceable through a detailed logbook documenting usage and maintenance activities. Hiring qualified personnel, coupled with ongoing training, helps strengthen the reliability of safety practices. A clear emergency plan should also be in place, including first aid kits, emergency exits, and insurance or safety devices.

From the earliest design phase, it is essential to involve all stakeholders—designers, artists, technicians, and managers—to anticipate potential risks. In the event of an incident, a thorough analysis should be conducted using methods such as the HPES approach (Human, Physical, Environmental, System), barrier analysis, and root cause identification, in order to implement appropriate corrective measures.

For a more detailed overview of general safety best practices, refer to the Guide d'Aménagement des Espaces de Formation (2023), at the section References (p.109).

Risk Management Process in Equipment Design

We recommend integrating a risk analysis process into your equipment design approach. Below is a brief overview of the main components that such an analysis should include:

1) Risk Identification: Identify all potential hazards associated with your apparatus and its use. Examples: cable rupture, mechanical failure, misuse, environmental conditions, etc.

2) Risk Assessment: Analyze each risk based on its likelihood of occurrence and the severity of its consequences, and develop a risk matrix. Risks can then be categorized as minor, moderate, high, or critical according to this combined assessment of probability and severity.

3) Implementation of Mitigation Measures: For every high or critical risk, develop and apply measures to eliminate or reduce those risks.

4) Evaluation of Measures and Documentation: Assess the effectiveness of the implemented measures and create documentation to increase awareness and understanding of these risks. This documentation should accompany the technical file of your apparatus. See Technical File (p.90).

An example of a risk analysis report is provided in the Appendix (p.119).

What to Do in Case of an Incident

The HPES method (Human Performance Enhancement System), referenced here, aims to understand the mechanisms that led to an undesired event using a systematic and evidence-based approach. It involves the following steps:

- Establish a timeline of events, based on interviews, document analysis, and examination of the work situation;

- Identify apparent causes by comparing what happened with what should have happened (reference situation);

- Search for root causes of the event (using the 5 Whys method);

- Conduct a defense system or barrier analysis to understand the failures in existing safeguards;

- Identify corrective actions, assess their effectiveness, and document all findings.

Risk Related to Innovation

In addition to safety-related risks, designing a new piece of circus equipment also involves another kind of risk: the risk inherent to innovation itself. This innovation risk reflects the uncertainty surrounding the relevance, feasibility, and likelihood of success of the proposed equipment.

Taking a step back is not always easy. When one deeply believes in an idea, it can be difficult to evaluate it objectively. This phenomenon relates to confirmation bias—the unconscious tendency to seek validation of one's intuition rather than truly putting it to the test. In a creative process, this tension between conviction and critical distance is constant: one must be convinced enough to dare to innovate, yet critical enough to recognize when an idea does not work. The challenge lies in finding the right balance between objectivity and belief in one's idea. Interviews with various creators and designers regarding their personal experiences revealed several key points to consider:

1) Assessing the potential of the idea is essential: In reality, it is often difficult to envision the technical feasibility and artistic potential of a new apparatus until the first practical test, especially when it introduces a new acrobatic vocabulary. Even so, it is important to evaluate the probability of its success in the early stages of the project.

2)Estimate the level of risk: Experts emphasized the need to conduct a risk analysis specific to the idea that assesses success probability, complexity, required resources, and potential consequences of failure to decide whether or not to proceed with development.

3) The need to convince and reassure others: Managing innovation risk involves not only the designer but also all stakeholders, such as companies, producers, artists, and technicians. It can be difficult to persuade a producer to support an idea perceived as risky. Some companies choose to "play it safe" by relying on proven concepts, while others embrace a degree of risk to foster innovation.

4) Limiting unforeseen production issues: Given time and budget constraints, managing innovation risk is crucial. Major failures or unforeseen problems can jeopardize production, but anticipating these risks from the design phase helps reduce delays, cost overruns, and team demotivation.

5) Decision-making factors: Deciding whether to continue developing a new idea requires examining multiple factors—artistic potential, technical feasibility, available expertise, budget, schedule, etc.—all of which depend on context and the level of risk considered acceptable.

Multiple Dimensions of Risk and the "Neutral Risk" Framework

Of course, the notion of risk is not limited to immediate safety hazards or negative consequences. It is equally important to recognize its positive effects on individual development, as shown in several holistic research perspectives. We therefore consider risk across its physical, psychological, social, and creative dimensions.

Recent research on human movement and development suggests that risky play can be a positive source of human growth. From a holistic perspective, while short-term negative outcomes (such as injuries) must be taken seriously, ignoring the potential long-term positive outcomes of engagement in risk-taking activities may itself have unintended consequences.

The neutral risk framework is an evaluative approach that considers all possible consequences of an activity—negative, neutral, and positive—without presuming that they are solely harmful or beneficial. In other words, the goal is not to eliminate all risk, but rather to analyze its potential effects across all dimensions (physical, psychological, social, creative) in order to understand its broader impact on individuals and their environment. This approach supports positive human development throughout life, helping individuals and communities thrive.

The scope of a neutral risk assessment should be proportional to the intended use of the equipment. For example, equipment designed for a research-creation project involving a small group of artists should consider its impact on the artists, the company, and the immediate community affected by the work. Equipment developed for a large touring show, on the other hand, should consider broader impacts—on artists, technicians, the company, logistics and transport, and culturally diverse audiences.

Finally, risk assessments should take into account the different phases of design and creation. In the development of a new piece of equipment or prototype, risks and outcomes may arise both during the creative process and in final use.

The following table illustrates an example of the potential positive and negative outcomes associated with the design and experimentation phases of a new circus apparatus for individuals and their environments:

Domain	Examples of Potential Outcomes (individus)	Examples of Potential Outcomes (environnements)
physical	Potential for improved biomechanics and skill development Acquisition of a new technique through experimentation Risk of injury during prototype testing	Modification of the physical space and potential need for new safety equipment, additional training for coaches, etc.
psychological	Sense of accomplishment when the prototype works Managing fear or stress related to failure	Promoting a culture of psychological safety Creating a learning environment that values trial and error
social	Collaboration with stakeholders, which may create tension Strengthening of team cohesion	Potential impact on the reputation of the artist or organization that created the new equipment Culture of co-creation
creative	Increased capacity for artists to create and innovate Exchange and confrontation of ideas	Development of a new acrobatic vocabulary Openness to new practices or acrobatic vocabularies

3.

Fabrication

Bringing the Apparatus to Life

3.1. Phases de fabrication

Once the design has been finalized, the fabrication of a new apparatus takes place through a collaborative workflow between the design team and the craftsperson or fabricator responsible for its physical construction. Below is an overview of the main stages in this process:

a) Material Procurement (Workshop/Artisan) : The artisan or fabrication workshop purchases the necessary materials according to the specifications outlined in the technical brief and manufacturing plans. It is possible that certain materials may be unavailable or subject to long wait times. The fabricator should communicate such information promptly so that alternative solutions can be explored if needed.

b) Material Validation (Artist and Design Team) : The artist and design team may validate that the selected materials meet the required technical needs. This step is not always mandatory but can be essential, for example, when the project involves specialized or unconventional materials.

c) Construction (Workshop/Artisan) : The artisan or fabrication workshop then builds the equipment following the manufacturing plans and technical specifications. It is important to request documentation of the fabrication process (photos, notes, measurements, etc.).

d) Technical Validation (Artistic and Design Teams) : An initial inspection by the design team, and, if possible, the artist, is recommended to ensure that the fabricated equipment aligns with expectations. During this inspection, ensure to test mechanical adjustments, assembly, stability, and finish.

e) Modification (Workshop/Artisan) : Adjustments may be required at this stage—for example, changes in dimensions or surface finish. Remember to update the technical drawings accordingly to reflect these modifications.

f) Finishing : The final touches are applied, including surface coatings (paint, varnish, corrosion protection, aesthetic details, etc.).

g) Delivery (Design and Artistic Teams) : The finished equipment is delivered to the design and artistic teams. We recommend to verify its compliance and condition upon delivery before proceeding to further use or testing.

4.

Appropriation

Breathing Life into the Apparatus

4.1. Validation Phases

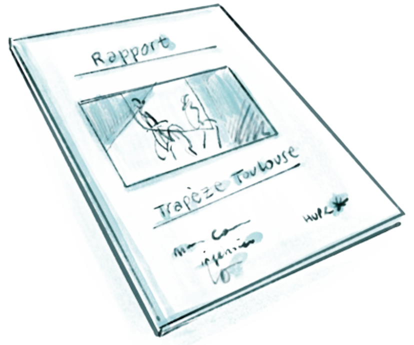
Once the apparatus has been delivered and meets all requirements; proven safe, functional, and faithful to its design, the next step is to bring it to life, in other words, to make it your own. Before fully integrating it into your performance, several validation phases must still be completed.

Technical and Acrobatic Validation
(Artist and Design Team)

Before proceeding with acrobatic validation by the artists, it is strongly recommended to first carry out a technical validation to ensure that the equipment is safe and compliant. This may include: Load testing (e.g., applying a weight equivalent to the maximum expected load in use); Suspension testing; Simulated use tests (without a human user); Functional checks to confirm that all components operate correctly; This technical validation may also take place at the time of equipment delivery.

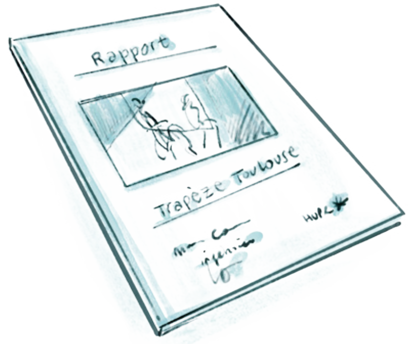
The acrobatic validation phase involves testing the equipment in real use conditions by the artists, under supervision, to assess both safety and functionality. We recommend establishing a testing protocol with a progressive series of movements and various scenarios, and recording the tests and observations for analysis. Artists can also be equipped with additional protective gear (such as safety cable, helmets, knee or elbow pads, etc.), in addition to standard safety equipment (mats, crash pads, etc.).

Modification (Workshop/Artisan)



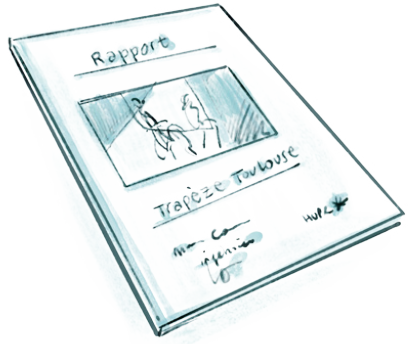
Following the technical or acrobatic validation, it may be necessary to request adjustments to the equipment from the craftsperson or fabrication workshop. This may also apply to the rigging system, depending on the nature of the project. Optimizations related to comfort, safety, aesthetics, or performance may also be considered. All modifications should be properly documented.

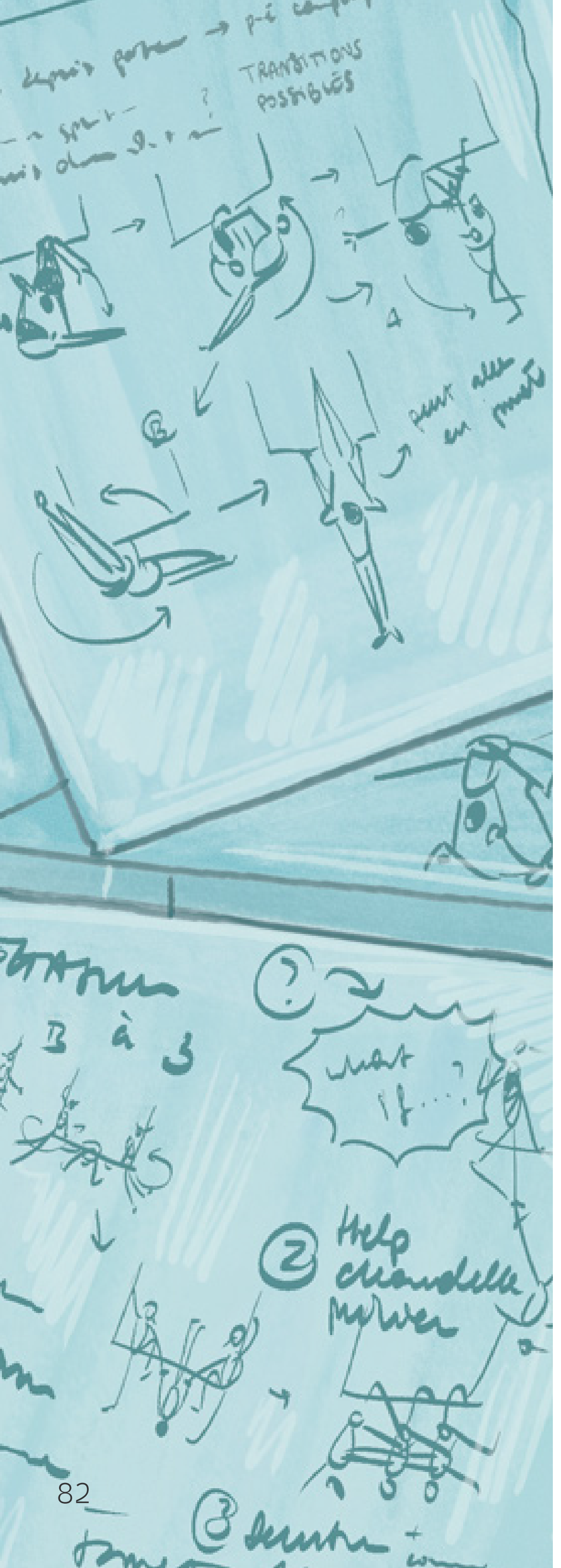
Documentation (Artist and Design Team)



Once the final equipment has been approved, the team should produce the final documentation, including the report and technical file (see Technical File, p. 90). This ensures that a detailed record of the design and development process is preserved.

At this stage, the apparatus can be used for training, artistic research, and creative development. If, during this process, new modifications are identified, it is entirely possible to return to previous steps and repeat certain validation phases as needed.





4.2 Creating with a New Apparatus

Designing an act or performance using a new circus apparatus can differ, sometimes subtly, sometimes significantly, from creating with an apparatus you have trained on for years.

There are countless creative processes: some follow established methods, while others are entirely unique to each artist. The goal of this guide is not to prescribe how to create with your new apparatus, but rather to offer reflection points worth considering, which we also suggest integrating into your budget and timeline.

Acrobatic and Artistic Research

Your new apparatus may possess its own language and can be regarded as an entity in its own right. The creation process is thus devoted to discovering its unique characteristics—exploring both its possibilities and limitations.

This exploratory work gradually allows a series of movements to emerge that reveal the individuality of the apparatus and enrich the artistic process. Some artists find it useful to begin by reflecting on the physical capacities they want to highlight or the artistic sensations they hope to evoke before starting exploration.

Exploring the new apparatus

Questions that artists—or anyone participating in this process—might ask include:

What feelings and sensations do I want to evoke (poetic, dynamic, spatial, relational, etc.)?

What physical capacities—strength, flexibility, balance, suspension—do I want to showcase?

What is the current state of the equipment?

Are there existing apparatuses or techniques that could be extended or reinterpreted?

What kinds of movement might this apparatus allow—or make difficult or impossible?

Such reflections can guide exploration sessions. For some, it may even be useful to create scale models or digital animations to simulate movement on or within the apparatus. It is also possible to test the apparatus without a human, using static or dynamic loads (weights, ropes, oscillations, etc.) to better understand its behavior.

Before beginning exploration, determine the desired risk level and set up a safe testing environment (harnesses, mats, helmets, etc.).

Listening of the apparatus

For many artists, this exploration phase centers on the human-object relationship—a key moment where the body engages in a dialogue with the object. The goal is to *listen* to what the apparatus allows, provokes, or prevents, in order to let a unique movement language emerge. Having an observer or acrobatic coach can be helpful. You might also invite riggers or the equipment designer to provide new creative insights.

Acrobatic possiiblities

We recommend starting with a comparative exploration: perform familiar movements inspired by existing apparatuses or principles, then identify which work and which differ. Build upon both—expand the successful ones and transform the less effective ones into innovative variations. You can also structure exploration around movement families: grips, points of contact, transitions, translations, rotations, swings, etc. Track key "success" or "failure" parameters such as amplitude, speed, duration of contact, and trajectory.

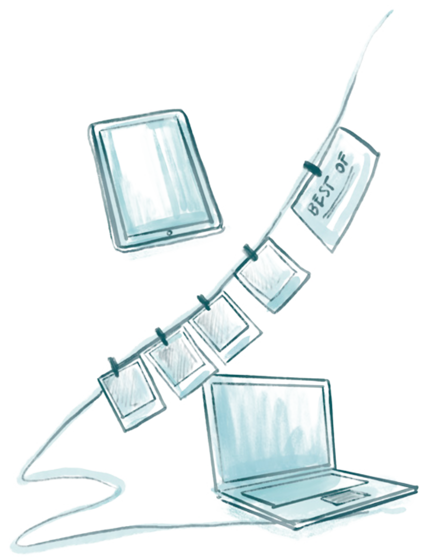
Keep in mind the added value of the apparatus and the movements it enables—new bodily dynamics, dramaturgical potential, and so forth. This stage of appropriation and understanding of the acrobatic vocabulary can be lengthy depending on the type of apparatus, but expect some happy accidents; unplanned discoveries often reveal great potential. You can catalog your newly developed vocabulary and name these movements to facilitate future organization or communication with other artists.

What if... ?

Given the richness of possibilities, one useful technique is to structure sessions around a series of questions such as, "What happens if...?" Begin by experimenting with what you already know. Each answer becomes a fragment. Explore these fragments, connect them, test them in new ways, and decide whether to keep or discard them (video editing can help with this process). Example: "I can hang by my elbow as on a rope—can I initiate another movement from my elbow?" See each answer as a new question. Connect complementary fragments (for instance, a three-ball juggling sequence could extend into a four-ball one). Turn your fragments into phrases, your phrases into sequences, and your sequences into building blocks for a full act.

Documentation

Some creators find it helpful to document their sessions, whether it be through video, photos, notes, or sketches. For example, if you film your sessions, you can review the footage after each one and, using editing software, compile a "best moments" file. This can be regularly refined by removing material that no longer serves your artistic direction. A tablet (such as an iPad) is preferable to a phone due to screen size. We recommend adding a budget line for multimedia tools, which may also include storage services, since you'll likely accumulate many video files and may need to share them with collaborators. Other creators, however, prefer to rely on embodied experience—trusting their sensations and avoiding documentation or analytical approaches. This is equally valid. When exploring a new apparatus, there are no fixed rules or guaranteed strategies for success. The unpredictability is precisely what makes the process so exciting—and, at the same time, so demanding.



Seek expertise

To broaden the range of possibilities and avoid being limited by your own approach, consider collaborating with experts from other disciplines. You might invite artists from different backgrounds to explore the apparatus with you. As a creator, this allows you to step back and observe. This process exposes you to new movement vocabularies and creative directions that may not be directly accessible from your own repertoire. You might even discover the potential for a new line of development requiring skills you have yet to master—creating new goals and directions.

Another valuable approach is to collaborate with outside eyes—such as artistic directors or dramaturges. These professionals often bring extensive technical, artistic, historical, and cultural knowledge. Acting as "midwives of performance," they specialize in supporting artists through the creative process. They can help make the apparatus and its movement vocabulary legible within a chosen context, or, if you are early in the process, help identify possible cultural or historical references that the apparatus and its movements evoke.

Finally, you can test your creation in front of various audiences to better understand how it is perceived. Work-in-progress showings or residency sharings with colleagues, friends, or family offer excellent opportunities for early feedback.

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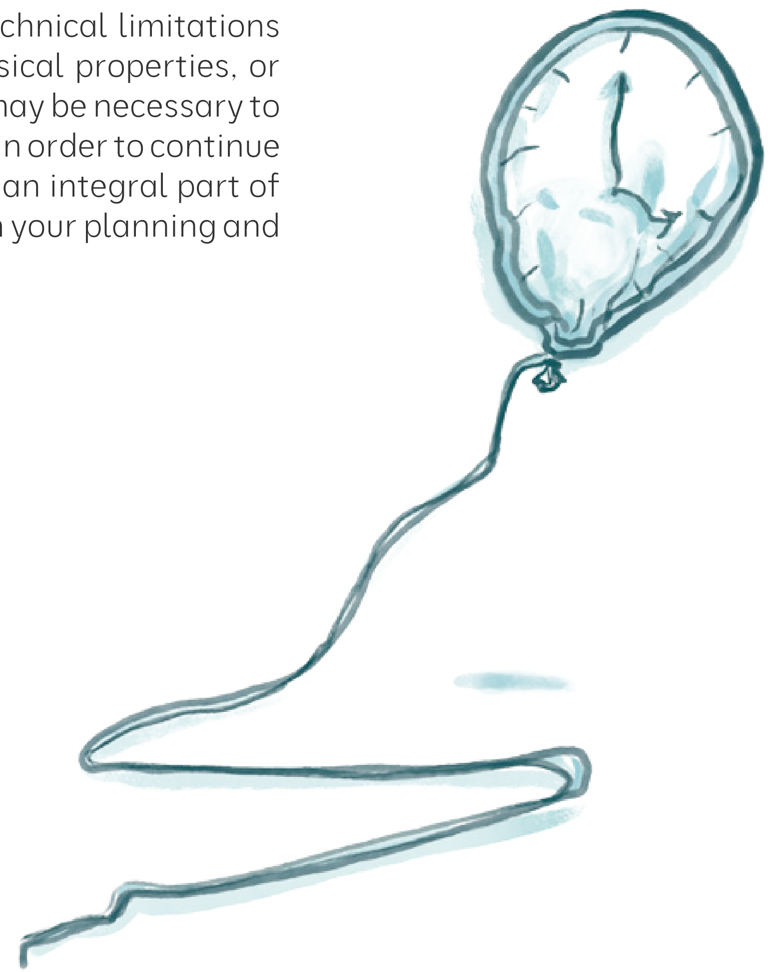
Allow some time

No matter which creative approach you take, you must plan for time. Creating with a new apparatus is a true commitment — it means engaging in research, exploration, and progress despite difficulties. The process requires perseverance and can sometimes feel long and painfully difficult.

Throughout this exploration, you may discover certain technical limitations related to the design of your apparatus, unexpected physical properties, or aspects that simply don't suit your needs. In such cases, it may be necessary to adjust the apparatus itself or rethink parts of your concept in order to continue developing your creation. These kinds of adjustments are an integral part of the creative process, so it is important to anticipate them in your planning and include them in your budget and timeline.



Some Guidelines for Collaborative Work

• If you want to preserve full copyright ownership of your act, it is recommended that each collaborator sign a non-disclosure agreement (NDA) that includes a non-compete clause.

• Make sure everyone is fairly compensated, based on an amount you all agree on. This can also take the form of an exchange of services or another non-monetary arrangement, as long as all parties feel the exchange is fair.

• Clearly define the usage rights for the content produced. Be sure to address the question of video ownership: are you free to use your colleagues' videos publicly? Do you want to? This discussion must take place and be documented in writing.

• We recommend inviting trusted people, those who are collaborative, open-minded, and respectful of your work. You need reliable and safe partners. Through this process, you may discover potential beyond your comfort zone or identify basic skills that are easy to acquire and that you can enrich with your own strengths to create something truly unique that you might not have found alone.

• Once you have gathered a collection of sequences, start building your act.

4.3. Multiple Versions

As you may have gathered by now, the design of a new piece of equipment is rarely a linear process where everything works perfectly on the first try. Most experts agree that development usually involves multiple versions, prototypes, and adjustments before reaching a final solution.

We therefore recommend approaching circus equipment design as an iterative process. Planning for these iterations from the very start—in terms of budget, time, and communication between teams—greatly increases the likelihood of achieving an apparatus that is safe, functional, and perfectly suited to artistic needs.

The more uncertainty an apparatus involves, the more likely it is that several prototypes will be required. Conversely, for example, if you are creating a variation of an existing apparatus with only minor modifications, it is quite possible that the first prototype will already be functional.

4.4. Technical File

Once the equipment has been delivered, it is time to compile a technical file. The technical file serves as the true "identity card" of your new apparatus. It details all key aspects related to its construction and proper use. This document should be carefully preserved, as it is essential, among other things, for validating the apparatus's entry and use in a certified performance venue. Without this file, for example, a technical director may refuse its use in a performance space.

The technical file is handed over to the artist by the design team at the end of the apparatus development process. It also serves as a record and reference for the project, both for the artists and the designers, as it specifies all the safety characteristics of the apparatus (its composition, load limits, handling procedures, etc.) and traces the development process, identifying everyone who contributed to it.

Contents

Every technical file must include the following elements:

• **Description of the Apparatus**
- Description générale
- Images of the apparatus
- Usage Conditions
- Context of use
- Type of physical work involved
- Anchoring conditions and materials (if applicable)

• **Project Report**
- Chronology of the design process
- People involved
- Dimensions
- Technical drawings
- Structural calculations
- User mass and dynamic factor
- Breaking load (MBL – Minimum Breaking Load): the maximum load the apparatus can withstand before breaking or failing
- Working load limit (WLL): the maximum load the apparatus can safely support
- Total authorized user mass: the total weight the apparatus can support without risk of deformation
- Manufacturing Information
- Date and place of manufacture
- Materials used

•**Certifications** for each component of the apparatus and its anchoring system (e.g., ropes, carabiners, slings, etc.)

• **Manufacturing plans**

• **Invoices**

• **Handling Information**
- Service life and usage lifespan
- Inspection frequency
- Reports of completed inspections (inspection dates and responsible person)
- Corrective actions taken during each maintenance

• **Risk and Safety Information**
- Risk analysis
- Safety protocol (emergency contacts, accident response procedures, designated call responders, weather protocol, etc., depending on the apparatus and its use)

• **Technical Sheet**
- Essential information (minimum stage space dimensions, minimum load capacities, etc.)
- Visual examples
- Installation plans

4.5. Handling and Maintenance

The artist's appropriation of the new apparatus must also include regular inspections and the adoption of good maintenance practices to ensure safety during use and to maximize the apparatus's lifespan.

The inspection frequency may vary depending on the case, but generally, a thorough inspection should be carried out once a year, while a daily inspection should take place before each use.

Inspection, Maintenance, and Lifespan

In general, an inspection should include a visual, auditory, and tactile check of all components, along with a functionality test of the apparatus. A good inspection is one that is actually performed—neglecting it, or being unable to perform it due to constraints, directly compromises the integrity of the apparatus and the safety of the artists using it.

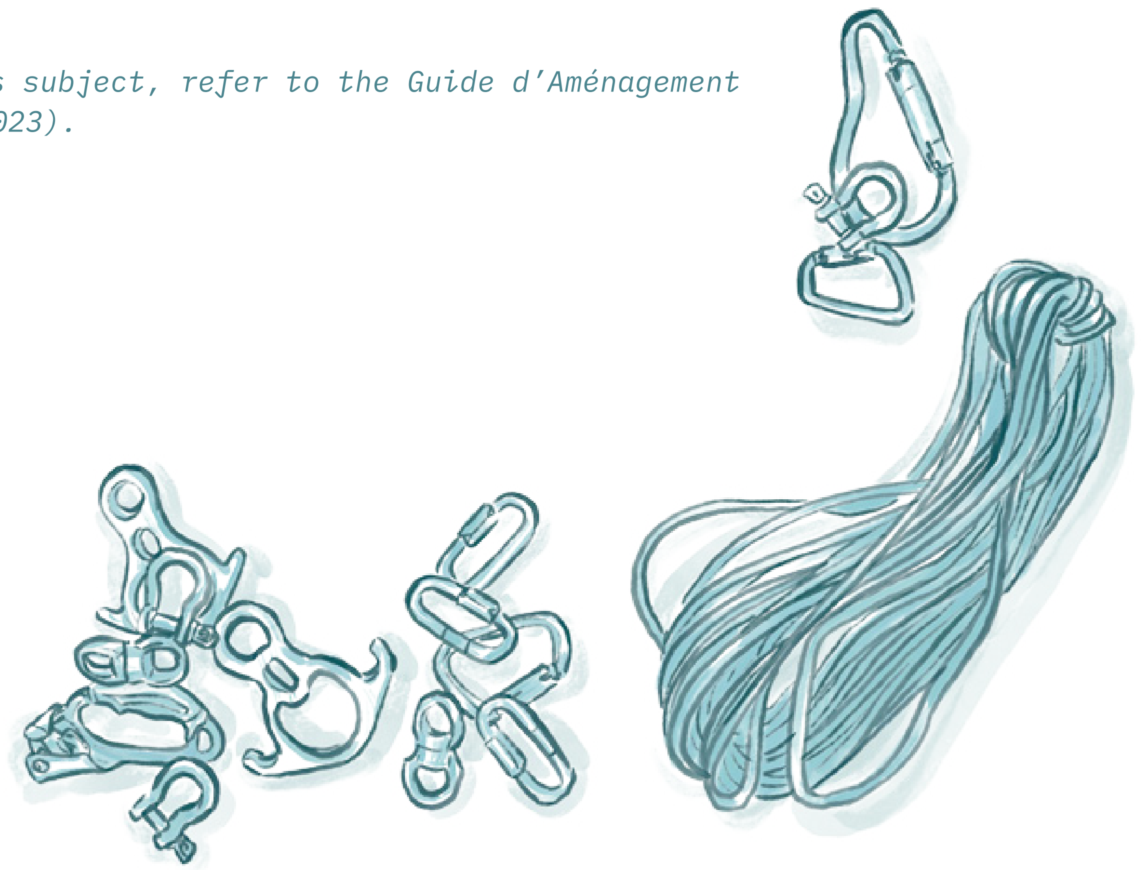
For aerial apparatuses anchored to the ceiling with a fixed system, inspections (whether monthly, seasonal, or annual) may require complete disassembly, untying of knots, and thorough examination of the apparatus in all its dimensions and components.

In general, any piece of equipment showing permanent deformation or a loss of more than 10% of its material should be considered unfit for use and must be destroyed to prevent reuse.

As for anchors, connectors, ropes, and other rigging components, it is essential to refer to the standards applicable in their original domain (industrial, sports, maritime, etc.) regarding their proper use, service life, and maintenance.

These parameters depend once again on environmental and usage conditions (frequency, humidity, storage). Depending on local regulations, it may also be mandatory to hire a certified third-party professional to perform the inspection of your equipment.

For more information on this subject, refer to the Guide d'Aménagement des Espaces de Formation (2023).



4.6. Intellectual Property

Intellectual property refers to the set of exclusive rights granted to creators over their intellectual creations. It is generally divided into two main categories: industrial property (patents, trademarks, designs, and models) and literary and artistic property (copyright and related rights).

A circus apparatus may fall under industrial property if its technical or functional aspect is protected, or under literary and artistic property if its artistic, expressive, or scenographic aspect is protected. This section provides an informative overview of both categories.

Brevet

A patent is an exclusive right granted for an invention, giving its holder a temporary monopoly of 20 years to prevent others from making, using, or selling the invention without authorization. To be patentable, an invention must be novel, inventive, and industrially applicable. A patent protects not only the final product but also the manufacturing process and any improvements made to it.

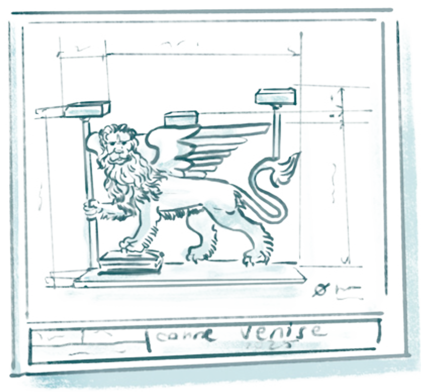
A patent application includes: a summary of the invention, a detailed description (with technical drawings if necessary), claims (defining exactly what you wish to protect), one or more illustrative drawings, and an administrative form. In Canada, applications are filed online through the Canadian Intellectual Property Office (CIPO) portal or via a patent agent. You must then request an examination within four years of filing. A CIPO examiner reviews whether the invention meets the criteria of patentability and whether the claims are clear and admissible.

If the examination is successful, you will receive a Notice of Allowance, followed by the grant of the patent. Estimated costs include: Filing fees: about $400–800 CAD, Patent agent fees: $5,000–15,000 CAD, depending on complexity, Examination fees: $1,160 CAD, Annual maintenance fees: around $650 CAD, depending on the year. These amounts change annually, so it is recommended to verify current fees on the CIPO website.

If an individual or company uses a patented invention without authorization, the patent holder may issue a cease-and-desist letter, file a lawsuit, or seek damages or an injunction to prevent unauthorized use. This is why the wording of claims is crucial: if claims are too broad, they may overlap with existing inventions and be rejected by CIPO; if too narrow, the protection becomes weak and easy to circumvent. Competitors may slightly modify the invention—changing a component, its position, or material—to avoid infringement.

For example, if a self-heating mug with a patent description that specifically states it uses a 3.7 V lithium-ion battery, a competitor might create the same mug with a 5 V battery to bypass the patent. A broader formulation such as "a mug comprising an internal electrical heating mechanism powered by an integrated energy source" would cover a wider range of cases.

Industrial Design or Technical Drawing



Protecting an industrial design grants you exclusive rights over the three-dimensional visual features of an object — not its function. This protection covers the shape, pattern, ornamentation, or visual combination of an object, preventing others from reproducing, copying, or imitating its visual appearance.

A design application must include: a clear visual representation of the object (drawings, renderings, or technical photographs), a description of the design (optional but recommended), and a filing form submitted online via the Canadian Intellectual Property Office (CIPO). CIPO examines the application to ensure that the design complies with legal requirements, is new and not already registered, and that it concerns purely visual aspects (not functional ones). If approved, the design is registered, a certificate is issued, and the right is published in the public register. The protection lasts 15 years.

Estimated costs include: Filing fee: about $610 CAD, Maintenance fee (after 5 years): $530 CAD, Patent agent or design agent fees (optional): $500–2,500 CAD, depending on complexity and number of drawings. These amounts change annually, so it is recommended to verify current fees on the CIPO website.

This type of protection is particularly recommended when a technical drawing or design features a distinctive or unique aesthetic.

For example: if a structure includes a circular frame, a competitor could easily reproduce it using a square or oval form; or if the base of a circus apparatus is sculpted in the shape of a lion, a competitor might reproduce it with a tiger-shaped base.

Finally, it is important to note that industrial design protection applies to a finished 3D object, whereas copyright may protect a 2D drawing. Therefore, in certain fields—particularly design—it may be advisable to file two applications to protect both the 2D design and the 3D model.

Copyright

Copyright protects artistic works in their entirety. In the case of a circus apparatus, it is the use of the equipment within an original staging, choreography, or performance creation, where the object serves as an artistic extension, that is protected. To qualify for copyright protection, the work must be original, fixed on a tangible medium (such as video, text, drawing, etc.), and created by a person.

Copyright does not protect ideas or concepts, the technical function of an object, or an improvised performance that is not recorded. In other words, the work must be written, filmed, drawn, notated (for instance, in musical or choreographic notation), or recorded in audio or video form. When fixing the work on a medium, it is important to document the date and location of creation to establish precedence in case of a dispute. Once an original work is created and fixed, the artist automatically owns the copyright.

However, it is also possible to register the work with the Canadian Intellectual Property Office (CIPO) to obtain an official certificate of copyright. To do so, you must complete an online form including: the title of the work, the type of work (musical, choreographic, artistic, etc.), the name(s) of the creator(s), the date of creation, the medium (e.g., video, text, PDF, etc.), and pay a $63 CAD fee online. The certificate is then issued and can serve as proof of ownership if a company reproduces or distributes the work without authorization.

Why register a work with CIPO? Registration provides an official certificate that serves as tangible evidence of ownership and the creation date. The work is entered into a public register, which means that if another party claims ignorance of the work's existence, it can be argued that the information was publicly accessible.

Each country defines its own intellectual property laws. A patent filed in Canada, for example, protects an invention only within Canada, unless additional steps are taken to extend protection internationally. By contrast, copyright enjoys international recognition through conventions such as the Berne Convention. However, enforcement can be limited in practice, which is why it is strongly recommended to register the work with CIPO.

4.7. Insurance

It is possible to find insurance policies specifically designed for circus arts, covering equipment, props, and performance-related risks. For instance, En Piste offers a Property and Equipment Insurance plan to its members that provides coverage for circus equipment and apparatuses. If you do not have specialized insurance or if your standard policy does not cover performance equipment, here are a few possible scenarios:

Theft from a Vehicle: If your equipment is stolen from inside a vehicle, coverage may come from the auto insurance or the personal property insurance of the vehicle owner (and in some cases, from home insurance), depending on the policy terms.

Breakage or Damage to Equipment: If a structural element of your apparatus breaks during a rehearsal or performance, a standard multi-risk insurance policy (for property and movable goods) may cover such damage under certain conditions.

Liability or Dispute Related to Equipment: If your apparatus causes damage to a venue (such as a stage or infrastructure) or injures a third party due to a defect in your equipment, you could be held legally responsible. Without insurance, the personal liability of the artist or the legal entity (company, association) could be engaged.

Carefully review your insurance policies to clearly understand what is covered and what is not—for example: theft, breakage, transport, professional use, etc.

For information regarding the engineer's seal, refer to the section Structural Analysis (p.62).

4.8. Some Recommendations

Protect or share? In the circus context, the answer is rarely binary. It is better to understand the different options and choose a strategy suited to your goals and needs.

To help you, here are a few key recommendations. Note that CIPO advisors (Canadian Intellectual Property Office) also offer guidance services, and you can contact them to discuss your specific situation.

Recognition Strategies

Document and publicize your creation: Even without a patent, you can establish public authorship by telling the story of your invention, whether it be through videos, articles, or a website. This creates a public record of authorship without requiring formal legal mechanisms.

Associate your name with the equipment: Naming an apparatus after its creator—like the "Cyr wheel"—is a powerful way to gain recognition. Such naming can foster implicit acknowledgment from the artistic community, even without legal protection.

Promote ethical collaboration: Encourage others to respect your creation without necessarily trying to restrict access to it. In a field with few formal regulations, collective ethics (such as not copying without permission) play an even more important role.

Dissemination Strategies

Adopt an open or closed approach? Some creators prefer to keep their invention to themselves out of fear of theft or to preserve exclusivity. Others, like Daniel Cyr, choose to share their invention, which often contributes to its recognition and long-term legacy. Here are a few possible approaches:

Encourage transmission to sustain the discipline: Passing equipment on to another artist, such as giving it to a younger performer, is seen as a way to legitimize and spread innovation within the circus community.

Value recognition over profitability: Many professionals emphasize that there is little financial gain in selling circus equipment. The true value often lies in the recognition of being the inventor, rather than in direct commercial sales.

Formalize any agreement with a major company using your creation: If a large company wishes to include your invention or equipment in a show, it is highly recommended to formalize the agreement in writing. You are entitled to request financial compensation. If you prefer not to monetize, you can instead request credit as the "creator of the equipment" in the program or a formal artistic collaboration. If you are not used to this type of negotiation, seek assistance to help you defend your interests effectively.

Protection Strategies

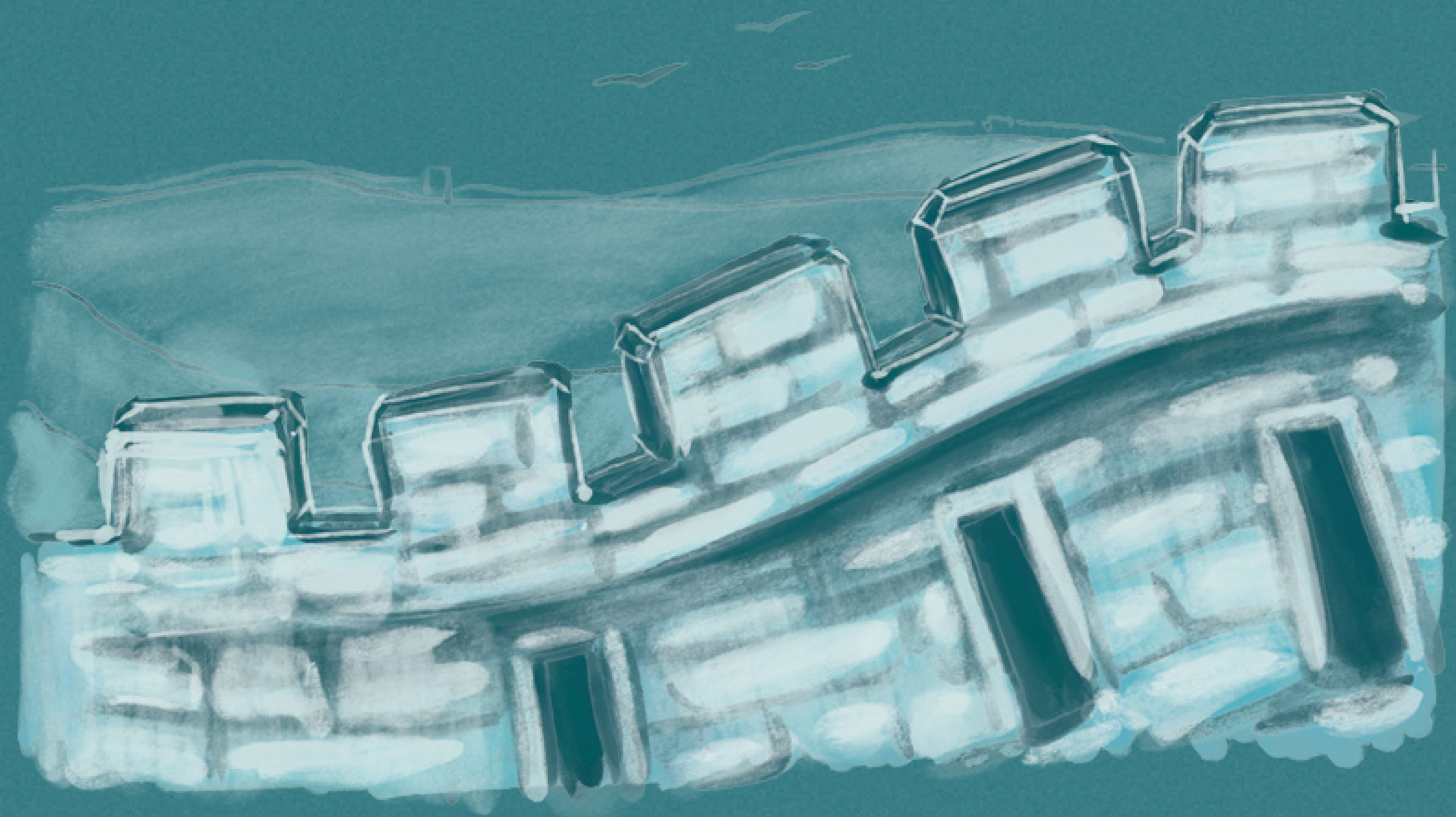
Identify the nature of what you are creating: Is it technical or functional, visual or aesthetic, artistic or choreographic, abstract or expressive? This will determine the appropriate form of protection.

Do not underestimate the complexity and cost: Filing a patent is lengthy, expensive, and difficult to enforce. Evaluate the actual benefit of such protection before engaging in the process.

Write claims carefully: If the claims are too broad, the application will likely be rejected. If they are too narrow, the protection will be easy to circumvent. Seek the support of a quali f ed patent agent if necessary.

Consider copyright registration: Copyright protection is automatic upon creation, but registering your work with CIPO can make legal proceedings easier in the event of a dispute.

Formalize any agreement before joining a troupe, organization, or company: If you are an artist joining a company or troupe while bringing your own equipment or choreography, it is essential to define the intellectual property terms from the outset.



We recommend drafting a written agreement beforehand to ensure your creation remains yours after the contract ends. If you are not familiar with such agreements, seek the help of a lawyer specialized in the arts.

In Conclusion

If you've read this far, it means you've taken the time to explore the main steps involved in designing a new piece of circus apparatus or equipment.

Although we have aimed to make this guide as comprehensive as possible, we are aware that it cannot be exhaustive. We therefore encourage you to deepen your research according to the specific nature of your project and to consult the references we have selected below.

We hope that these pages have helped clarify the fundamental benchmarks of the equipment development process, and that the tools presented here will assist you in optimizing your time and budget while easing certain constraints. In short, we hope this guide will accompany you as you navigate the often uncertain and still relatively unregulated path—from the spark of an idea to the full mastery of a new circus apparatus.

Finally, we encourage you to fully commit to your creative journey, adopting a responsible approach toward originality, copyright, fair recognition of labor—yours as well as others'—and the ethics of collaboration in all its many dimensions.

Thank you, and best of luck with your project!

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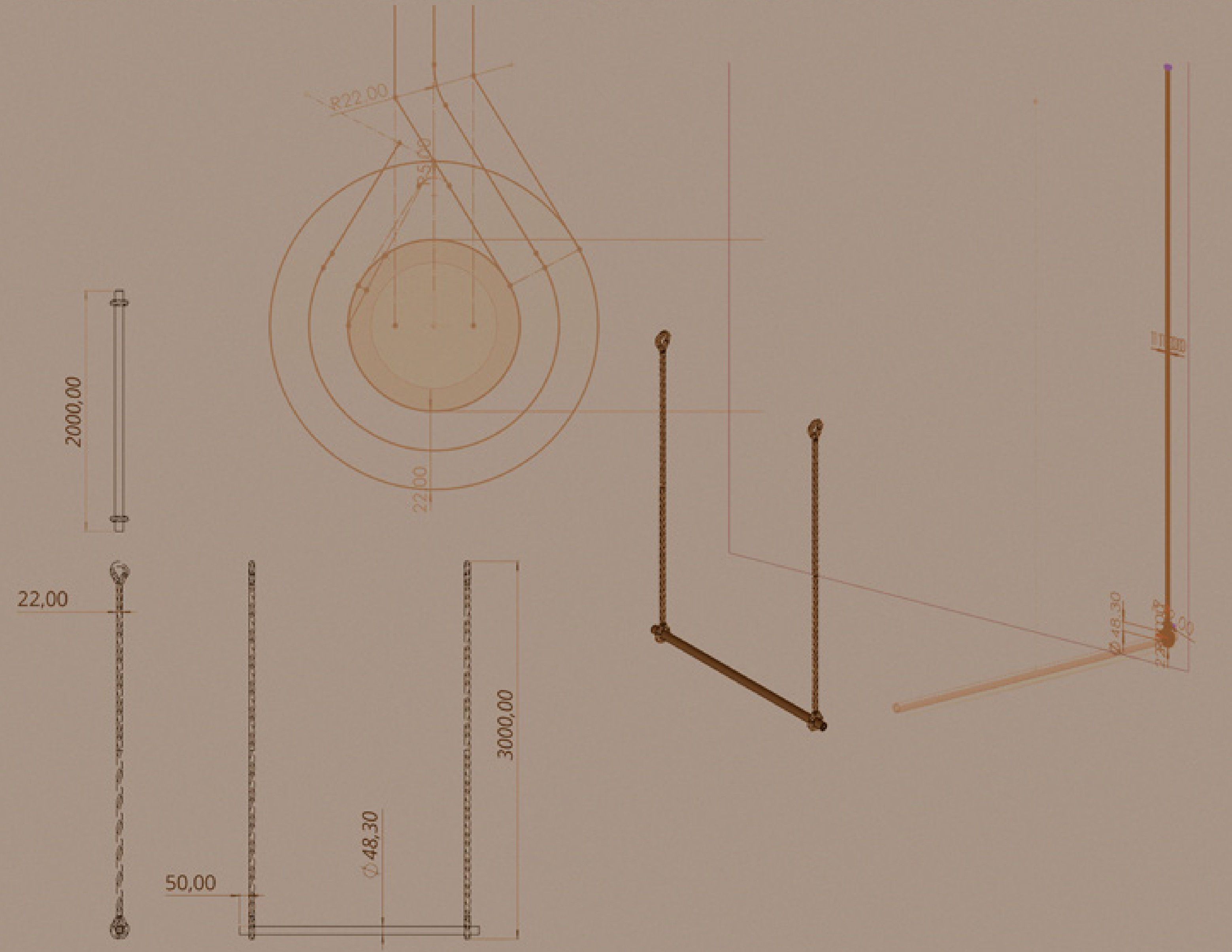
APPENDIX



appendix

Creative Approaches and Techniques

All the experts interviewed agreed that artists and designers are never short on imagination or ideas. Nevertheless, we offer here a few creativity techniques to help generate new ideas or enhance the ones you already have. The purpose of this section is simply to inspire you and suggest a few directions to explore. Feel free to add your own methods for stimulating creativity!

Tool	Definition	Use	Limitation
Brainstorming and its variants (Brainwriting, Brainsketching, etc.)	Free and spontaneous generation of ideas in a group, with possible written or drawn variations	Rapid ideation, generating a large number of ideas	Risk of domination by certain participants; ideas can sometimes remain superficial
Mind Map	Visualization of ideas in a tree-like structure starting from a central concept	Structuring ideas, exploring a topic visually	Some mind maps can become overly complex and hard to read
Role-Playing / Simulation	Embodying a specific user, scene, or use case	Generating original solutions, putting oneself in another's position or situation	Requires participant engagement
Analogy Technique	Seeking ideas by comparing with other domains (e.g., nature, animals, etc.)	Generating new ideas	Requires associative thinking; some analogies may seem too distant or inapplicable

Tool	Definition	Use	Limitation
Random Stimuli	Drawing a random word, image, or external element and linking it to the problem to spark new ideas	Unlocking creative blocks, generating novel associations	Requires associative thinking; some stimuli may feel irrelevant or too far-fetched
Six Thinking Hats	Adopting six successive perspectives: emotion, facts, creativity, criticism, benefits, organization	Structuring group discussions around an idea or problem	Requires clear facilitation to avoid confusion
Disassembly / Decomposition Method	Breaking down an object or problem into its components to imagine variations	Designing or improving an existing product or idea	Can become highly technical
ASIT / TRIZ	Systematic methods: TRIZ (Theory of Inventive Problem Solving) and ASIT (Advanced Systematic Inventive Thinking)	Solving complex technical problems; useful for addressing innovation deadlocks	Requires prior learning; not intuitive for beginners
Design thinking	Human-centered iterative process: empathy, definition, ideation, prototyping, testing	Designing innovative products with user needs in mind	Time-consuming process
SCAMPER	Acronym for Substitute, Combine, Adapt, Modify, Put to other uses, Eliminate, Rearrange	Improving or transforming an existing product or concept	Requires a concrete starting point

appendix

How to implement these tools :

Tool	Implementation
Brainstorming and its variants (Brainwriting, Brainsketching, etc.)	Work in a group and ask a clear question such as: How could we solve this problem? or Do you have new ideas for circus equipment? Rules for the group: no judgment, aim for quantity before quality, and encourage building on others' ideas. **Possible variations:** Brainwriting 6-3-5: 6 people, 3 ideas in 5 minutes, then pass the sheet to the next person to add on; Brainsketching: draw ideas instead of writing them; Silent session: ideas are first written individually to avoid self-censorship.
Mind Map	Write a theme in the center of a page or board (e.g., gravity, balance, etc.). Add main branches to divide into categories or subtopics, then continue with sub-branches for ideas or examples. You can use colors, drawings, pictograms, and symbols to enrich it. **Variations :** Individual mind map Collective mind map on a large sheet or whiteboard
Role-Playing / Simulation	Define a context—a scene, a user, or a use case—and explore where it might lead. You can assign specific roles (different artists, technicians, audience members, etc.) or keep it open. You may also set an objective or a problem to solve within the role. **Possible variations:** With an object: manipulate real, mock-up (e.g., cardboard), or repurposed objects (e.g., ropes) while improvising; Scripted: short scenarios to explore concrete uses; Improvised with feedback: each person plays a role, acts out the scene, then shares what they felt and generates new ideas.

Tool	Implementation
Analogy Technique	Choose an analogy (e.g., an animal, a profession, a system) and ask questions such as: If this piece of equipment were a restaurant / an animal / a sport, which one would it be? Why? You can also think of absurd or opposite situations, for example: How couldcan the equipment become unusable?
Six Thinking Hats	Start by presenting the idea or problem to be evaluated. Then, one by one, adopt each perspective: White Hat: facts, data; Red Hat: emotions, intuitions; Black Hat: risks, criticisms; Yellow Hat: benefits, advantages; Green Hat: new ideas, creativity; Blue Hat: organization, synthesis. **Possible versions:** Individual: one person applies all six perspectives sequentially Group: each participant embodies a different hat Sequential group: everyone goes through the six hats together, one at a time
Disassembly / Decomposition Method	Take an existing object, concept, or piece of circus equipment and identify its functions or components (e.g., sub-elements, connections, comfort, aesthetics). Then, for each part, seek alternative options. **Variations:** Functional: break down by function (e.g., rotate, fold, bounce, support, etc.) Physical: break down by materials, shapes, or colors Narrative: break down by use or life cycle (e.g., transport, setup, performance...)
ASIT / TRIZ	**ASIT (Advanced Systematic Inventive Thinking)**/For an existing piece of equipment or concept, go through each step: Divide the equipment or a component to make it more useful or create a new function; Add a duplicate component to create a new interaction; Remove a component while keeping the original function; Imagine one component serving multiple purposes; Introduce asymmetry to spark new ideas. **TRIZ (Theory of Inventive Problem Solving)**/For an existing piece of equipment or concept, identify a conflict between two technical parameters; Then apply one or more of the 40 TRIZ principles. Examples include: Divide an object or system, Remove a troublesome element, Make an object adaptable or flexible, Modify the shape, color, or state of an object.

appendix

Tool	Implementation
Design thinking	Go through each step of the process: Empathize: go into the field, observe, and interview users. Define: reframe the problem around user needs. Ideate: use creativity techniques to generate ideas. Prototype: create a model of the solution (mock-up, scenario, object). Test: present it to users, collect feedback, and iterate.
SCAMPER	For an existing piece of equipment or concept, go through each SCAMPER question: Substitute: a material? a function? Combine: with what? Adapt: for another use? Modify: the shape, size, or color? Put to other uses (Permute): switch roles or functions? Eliminate: a component? Reverse/Rearrange: the order, direction, or logic? **Possible formats:** Individual: each person works through the SCAMPER questions alone. Collective: each person or group focuses on one letter of SCAMPER. Sequential: the entire group goes through all the letters successively.

These techniques are presented in a succinct and introductory manner. Since the list is not exhaustive, we recommend consulting additional resources if you wish to deepen your understanding or implement them rigorously.

Document Exemple : Risk Analysis

Noms du numeros:	Fil de marche

1 - Blessure légère
2 - Premiers soins
3 - Soins médicaux
4 - Blessure grave
5 - Décès

	Échelle d'évaluation des risques	Niveau de gravité				
		1. Blessure légère	2. Premiers soins	3. Soins médicaux / Assistance médicale	4. Blessures graves	5. Décès
Probabilité	1. Nulle	Mineur	Mineur	Moderé	Élevé	Élevé
	2. Faible / peu probable	Mieur	Mineur	Moderé	Élevé	Élevé
	3. Moyenne / Possible	Mineur	Moderé	Moderé	Élevé	Élevé
	4. Elevée	Mineur	Moderé	Élevé	Élevé	Élevé
	5. Extrémement probable	Moderé	Moderé	Élevé	Élevé	Critique

RISQUE				RISQUE INITIAL	MESURES DE CONTROLE		RISQUE RÉSIDUEL	
Description	Type de risque	Source du risque	Personne à risque	Évaluation du risque	Liste des mesures de contrôle	Évlauation du risque	Divers	Risque acceptable ?
Description de l'élément à risque	Description des effets ou des conséquences qui peuvent se produire si le risque se concrétise	Description de la source du risque	Nommer les types de personnes à risque	Évlauer le niveau de risque avant la mise en place des mesures de contrôle avec la matrice ci-haut.	Description complète des mesures de contrôle en place pour contrôler, réduire ou éliminer le risque.	Évlauer le niveau de risque après la mise en place des mesures de contrôle avec la matrice ci-haut.		Indiquer si le risque résiduel est acceptable
L'artiste effectue une traversée du chapiteau sur un fil qui va de 4 metres de hauteur à 100 cm.	Chute de 4 métres au debut du numero	Erreur de l'artiste	L'artiste	Moderé	l'artiste est entrainé pour cette activité	Mineur		OUI
L'artiste effectue une manipulation du fil avec les mains.	Blessure aux mains, principalement aux doigts	Performance	L'artiste	Moderé	l'artiste porte des gants de protection lorsqu'il souhaite faire des manipulations avec le fil	Mineur		OUI
Rupture du câble	Chute de l'artiste	Défaillance équipement	L'artiste	Moderé	Normes d'utilisation du câble respectée, inspection faite avant installation et gréeur expérimenté a fait l'installation	Mineur		

Procedure de sauvetage			Description	Mise en place requise	Divers
Défaillance technique:	Oui	Non			
Procédure specifique pour artiste blessé:	Oui	Non		voir plan d'urgence	
Divers: présence gréeur expérimenté à ce genre de montage	Oui	Non			
Formation:			**Description**	**Lieux et description de la formation**	**Divers**
Formation specifique requise:	Oui	Non			
Formation de l'artiste(Ecole, experience...)	Oui	Non	Ecole de cirque	École de cirque + 10 années d'expérience	

Approbation	Documents fait par:	[TITRE]	[NOMS]	[SIGNATURE]	[Date]
		Concepteur acrobatique			
		Projet Manager			
		D.T			

Conceived as a true companion, this guide supports artists and creators from diverse backgrounds in developing equipment that reflects their artistic vision. Rather than prescribing a single method, it brings together a range of perspectives to offer accessible and inspiring points of reference throughout the process.

Our aim is to dispel uncertainty, promote best practices, and help mitigate the inherent risks of working with new and untested apparatus. Since equipment design is a vast and constantly evolving field, this guide does not seek to be exhaustive. Instead, it provides adaptable reference points that can be tailored to the specific realities of each practice.

HUPR Research Centre for Human Potential

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