

## Information for Prospective Corporate Sponsors



*"Advancing space safety is within our reach and it is not only a moral duty but the key for expanding space programs and making them more and more economically viable".*

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## **1.0 INTRODUCTION**

### **1.1 Why to become a Corporate Sponsor?**

The space industry is expanding worldwide and with it the safety risk because of poor attention, lack of technical progress in the field, cumulative effects, and weak or non-existent international rules. Eventually the prospect for industry growth will be badly hurt if the necessary course of corrective actions is delayed.

Safety risk in space missions refers to the general public safety (on ground, on air and at sea), safety of launch range personnel, and safety of humans on-board. Space safety is also generally defined in a wider sense as encompassing the safeguard of valuable facilities on ground (e.g. launch pads), of strategic and costly systems on orbit (i.e. global utilities) as well as the safeguard of the space and Earth environment.

The International Space Safety Foundation (ISSF) is sponsored by aerospace corporations that have interest to cooperate in space safety and related engineering, management and standardization matters.

The ISSF is currently seeking the involvement of high profile corporations as sponsors. Such involvement would provide the financial backbone to the Foundation and it is crucial for the realization and economic viability of the Foundation's research, educational and standardization programs.

As mentioned above sponsorships and donations are essential for the further development and advancement of space safety. Then the question is: why should a corporation sponsor the ISSF? There are multiple reasons.

The first reason is that ISSF activities represent an additional strategic opportunity for focused cooperation, communication, informal data exchange and common progress in the field of space safety risk control at a time when commercial exploitation of orbital space has become the leading space business. The space safety field, from launch, to re-entry, space debris, and human exploration, is by its own nature very much a global industrial interest which often extends beyond the traditional external contacts and cooperation which a corporation organization may be already maintaining. Furthermore space safety is a common key interest of all three communities operating in space, namely the civil, military and commercial space programs communities. Corporations have a stake in all three branches but should unite, in particular, when dealing with commercial space programs. On the other hand a trade association is not the best place to deal with safety matters that need to be kept separated from economic interests. Industry goals in safety matters are better pursued through an industry-supported but independent non-profit organization that can ensure a high degree of integrity and specialized competence. There is no other common interest which is so binding and unifying as space safety in its broad sense.



The second reason is that space industries are more and more concerned with creating and maintaining a “safety culture” within their own organizations and suppliers chain. For this purpose four elements are essential:

- a) an overall set up which allows an adequate system of checks-and-balances;
- b) a core of highly competent professionals in safety and related disciplines,
- c) a diffuse knowledge of key safety principles and practices throughout the ranks of the organization, and
- d) a general safety-minded attitude.

The ISSF research activities, studies, conferences, seminars and training programs represent additional available resources in support of corporations efforts to develop, expand and maintain a robust “safety culture” and knowledge management in their organizations and suppliers chains.

Last but not least, safety is a strategic business development driver in many advanced industries and in space industry as well. Safety advancement remains one of the key prerequisite for the success and expansion of many businesses (e.g. commercial aviation, high speed trains, etc.) Sometimes continuous safe performance is even critical for company, program or sector survival. The faulty design of a single product can kill its manufacturer’s business. An unsafe design may kill (sooner or later) a unique design and operational concept. A single major disaster can endanger an entire industrial sector (e.g. nuclear power generation after Fukushima). Any support to safety initiatives is a positive contribution to the well being, progress and expansion of the entire space industry.

## **1.2 Donating for safety for industry growth: the aviation precedent**

In the beginning of the past century the Guggenheims were a wealthy family who had made the bulk of their money from the mining industry. They believed they had an obligation to return to society some of the benefits they had reaped, so in 1924 they established the Daniel and Florence Guggenheim Foundation to promote a variety of charitable and benevolent causes.

After World War I, aviation in the United States was in a depressed state. Not only had the surplus of planes from the war eliminated the market for new aircraft, but also the majority of the American public had little interest in flying, largely because of its risky nature. And it was extremely risky, plagued by accidents and fatalities. But there was no pool of trained aeronautical engineers to improve the design and construction of aircraft. Thus, the Guggenheims set out to establish schools or research centers at universities around the country. They also set about to make air travel safer by using their fund to pay directly for aviation research. This research contributed to the development of more reliable aircraft engines and instruments, and eventually, public acceptance of aviation as a safe and fast method of transportation.

In the early times of aviation improvements in instrumentation were needed. Airplane pilots all knew that weather greatly affected flight safety, particularly when it reduced visibility. Fog, which could reduce visibility to nothing, was probably the most serious



condition that pilots faced. Pilots who encountered fog quickly became disoriented and often crashed into the ground. The Guggenheim foundation paid for studies of "fog flying" and improved navigation by means of better instruments that would give pilots The information they needed to fly safely even if they couldn't see where they were going.

The Guggenheims felt that aircraft could be made safer by improving their aerodynamic characteristics. In 1927, they announced the Safe Aircraft Competition, offering a \$100,000 prize and five \$10,000 secondary awards for the safest aircraft that could be built.

The Guggenheim fund also created a "Model Airway" between San Francisco and Los Angeles that was operated by Western Air Express. This demonstration helped convince the American public that commercial passenger service could be safe, dependable, and comfortable and could exist apart from the airmail business. The service began on May 26, 1928, flying a Fokker F-10 Super Trimotor that Guggenheim provided. The scheduled flights gradually became part of Western's regular service. The flights did not prove financially profitable, but they were heavily used and demonstrated that regular, safe passenger service was a reality.

The Foundation educational activities began in 1925 with a grant for the establishment of a school of aeronautical engineering at New York University. Over the next four years, the fund would make grants that established Guggenheim schools or research centers at the California Institute of Technology, Stanford University, the University of Michigan, the Massachusetts Institute of Technology, the University of Washington, Georgia School (later Institute) of Technology, Harvard University, Syracuse University, Northwestern University, and the University of Akron.

Between 1925 and 1930, the Guggenheim family invested more than \$2.6 million in a series of aviation-related programs. In 1947 the Guggenheim financially supported the establishment of the Flight Safety Foundation (FSF) of Jerome Lederer, which remains still today the leading worldwide non-profit independent organization in aviation safety research and education In 1950 the Daniel and Florence Guggenheim Foundation created the Cornell-Guggenheim Aviation Safety Center at Cornell University, where research was carried out in collision avoidance, crash fire protection, human factors, instrumentation error prevention, prevention of in-flight explosions. Eventually the center was closed in 1967 when the original foundation goal was achieved of making transportation by air as safe as trains.

## **2.0 A FOUNDATION TO ADVANCE SPACE SAFETY**

Although the risks of space missions are in a number of cases related to the extreme of the space environment and to the technological limits, it is a fact that as of today all space accidents happened because of design, manufacturing or operational deficiencies which were well within the knowledge and capability of the time to control and prevent.



The main causes of failures and malfunctions are design errors and manufacturing errors. Catastrophic design errors in space projects can be tracked essentially to a difficult balance between on one side the complexity of the space systems, and the relative ease by which failures or malfunction of highly energetic systems can propagate to catastrophic consequences, and on the other side the limited systems safety engineering culture of the design teams as a whole. Manufacturing errors result in product nonconformities which may go undetected thus causing all kinds of consequences.

The space systems complexity as well the complexity of the overall organization involved in their realization and operation, requires a substantial advancement of the science of spaceflight hazards mitigation and control, and of risk assessment techniques. Furthermore it is required that the project teams maintain a safety culture based on a widespread knowledge of key principles and techniques of design for safety, and on a multidisciplinary awareness of hazards and potential vulnerabilities in the design, manufacturing and operations. Unfortunately safety design methods and hazard analyses techniques are not currently taught in any engineering school. In the aerospace industry on the job training in systems safety is usually reserved to small specialized groups of safety engineers, which often lack the necessary in depth system knowledge to become integral part of the design teams.

The safety risk level currently achieved in space mission (manned and unmanned) is inadequate. Without a “quantum leap” in safety any further expansion of the space industry may become heavily constrained. At current state-of-art human spaceflight may never become commercially viable and at the end of Space Station program it may even be at risk of extinction or postponement for several generations. Advancing space safety is within our reach and it is not only a moral duty but the key for expanding space programs and making them more and more economically viable. To advance space safety, improved education, exchange of knowledge, and focused studies are needed. The final goal of the ISSF is to promote such advancement by identifying related programs, raising funds from sponsors and private donors, and making them available to qualified universities, colleges, researchers and professional organizations. Sponsors and donors may chose to support the overall Foundation efforts, or have their support linked to one or more programs, or even to a specific project.

### **3.0 FOUNDATION PROGRAMS AND THEIR MANAGEMENT**

#### **3.1 Management**

The ISSF is dedicated to the advancement of space safety through international cooperation in research/studies activities, development of space safety standards, establishment of academic and training programs, motivational campaigns including recognition of outstanding contributions to space safety, and assistance to young people and professionals to acquire or further develop the necessary knowledge. In order to achieve these goals the ISSF needs adequate funds and professional management. This



involves maintaining active liaison with space agencies, corporations, and individuals in the space safety field, as well developing effective communication (web site, newsletters, press release, and journal), maintaining accurate financial accounts. Such professional management, based on the experience of similar institution, may need to spend up to 20% of funds on its own operations.

### **3.2 Program of activities and funding allocation**

The Foundation programs are defined in terms of strategic directions and generic areas of interest and therefore remain generally valid in the long period. In any case the programs are reassessed, modified or updated by the ISSF Board as the need arises. The programs are executed through the selection and completion of projects which are part of multi-year planning. The Foundation financial resources are allocated to the programs on the basis of pre-defined fixed percentages which take into account the relevant expected effectiveness in supporting the Foundation ultimate goals. The further allocation of program funds to detailed projects is performed in the course of the projects evaluation process.

#### **3.2.1 Research and Development Program**

Currently space agencies and their contractors invest very little in general space safety research and tend to focus activities on project specific matters. In any case they look to matters from a national programs perspective even when international cooperation is involved. A global space safety research and development program aiming to support dedicated systems development, global risk management, and international cooperation is practically non-existent.

The ISSF research program aims to initiate innovative research projects in the field of space safety and to pursue whenever possible those study topics which may benefit from international exchange and cooperation. The ISSF research and development program aims to stimulate the expansion of government and contractors space safety research efforts by undertaking precursor studies and publishing results. The ISSF research initiatives will include funding of general studies in support of global risk management, conceptual studies of innovative systems, development of dedicated safety equipment, as well as performance of detailed studies on specific topics. Particular attention is paid to studies about risk for the public, including environmental impact, and studies of space systems interoperability, which could pave the way for the establishment of standard interfaces to allow mutual assistance in case of emergency.

The ISSF research program places emphasis on the involvement of academia and on synergies with industry. The ISSF studies will also aim to develop an international space safety culture by encouraging the setting up whenever possible of international studies teams to compare, discuss and bridge differences.



### 3.3.2 Standardization and Independent Safety Certification Program

Space up to and including geostationary orbits has become as international sea waters and airspace another realm where it is in the interest of the global community to operate in accordance with common international safety standards instead of vague principles. Voluntary consensus space safety standards need to be agreed internationally by industrial and institutional stakeholders as reference for the design and operations of space systems.

The ISSF promotes the incremental development of international space safety voluntary standards in four main directions: a) public risk and protection of assets on orbit; b) development of minimum safety standards for commercial human spaceflight; c) easing of barriers that different national safety regulations may create to international commerce, while preventing distortion of commercial competition due to substandard safety practices; d) development of space missions safe-and-rescue interoperability capabilities.

The ISSF seeks to support the development and establishment of independent commercial services of flight safety certification and testing on the model of well established successful practices in other industrial branches. The ISSF would support the costs of studying and developing the concept and of initiating such services until they become self-sustained on a commercial basis.

### 3.3.3 Academic and Training Program

The effective education of professionals in the space safety field depends on the availability of relevant and up-to-date academic courses in all areas related to space safety. The Foundation will undertake surveys of University officials and professors to determine what courses are already available and to seek to initiate wider and more comprehensive academic programs in space safety worldwide. The Foundation will also seek to endow fellowships, scholarship, study grants for students as well as endow professorships in the field of space safety.

Furthermore, the key to effective space safety is the availability of well-trained and current professionals in the space industry that have the right skills and current knowledge of the latest space and safety technologies. The ISSF will further develop its offer of the best, most current training courses in the space safety field. Although on-site training with quality instructors is a key element of such programs, the Foundation will also seek to develop effective and interactive e-learning courses that can allow professionals worldwide to obtain just-in-time, affordable training that meet their individual needs.

### 3.3.4 Conferences and Workshops Program

Critical to the success of progress in space safety around the world is the collaboration and exchange of ideas among professionals and academic, governmental and industrial researchers in the field. Conferences and workshops are aimed to the exchange of ideas,





question new findings, and learn of critical experience and new data in the field. The Foundation will make use of the additional funds provided by sponsors and donors to expand its leading role in organizing and conducting conferences, workshops and seminars in the field of space safety.

### 3.3.5 Motivational Program and Researchers Prizes

Another aspect of innovation and progress in the field of space safety is the stimulation as well as recognition of outstanding contributions to the field that move or have moved the state of the art forward. There are a number of strategies as to how such progress can best be achieved. These include lifetime achievement awards, innovation awards, design challenges, and prizes and awards for student researchers. The Foundation will make use of the additional funds provided by sponsors and donors to establish new endowments to support such awards and recognitions and challenges, in particular prizes for original research work.

## 4.0 FUNDS RAISING AND SPENDING

### 4.1 Funds raising

Funds to ISSF programs/projects are provided by *Corporate or Institutional Members* and by *Exceptional Donors*, which having recognized the importance of ISSF goals for the human progress in space are willing to financially contribute to their achievement on a philanthropic basis.

*Corporate or Institutional Members* are those corporations or institutions which volunteer to make annual donations, and receive in exchange certain services like access and use of ISSF studies results or discounts for their employees' attendance to conferences, seminars, workshop and training events organized by ISSF. Membership fees depends on size/importance of the organizations:

- Top Organizations: \$10,000
- Large Organizations: \$5,000
- Small-Medium Enterprise: \$1,000

*Exceptional Donors* are individuals, institutions or corporations which make substantial grants to ISSF on extemporary basis (i.e. once or without pre-determination of amount and periodicity). Exceptional donors will belong to one of the following three categories:

- Benefactor: \$25,000 or more
- Patron: \$15,000-24,999
- Contributor: \$10,000-14,999

## **4.2 Funds spending**

### **4.2.1 R&D Studies Contracts**

The Foundation will assign R&D tasks to public or private entities such as universities, research laboratories, firms, and experts. To that end the Foundation will conclude research contracts under which the contractors are bound to make available to the Foundation any resulting invention or technical data under free, non-exclusive and irrevocable license. In other words, inventions or technical data resulting from an ISSF research work are owned by the contractor, who may or may not protect them by registered patent, and exploit them. In exchange, the ISSF and its Members may use the inventions or information under free irrevocable and non-exclusive license.

The Foundation R&D program is managed by the ISSF Academic and Research Programs Committee. The R&D program is established and updated every year through a *Call for Ideas*, for the two following years, and it is open to experts and scientists active in space safety and related fields. For the evaluation and rating of the proposed ideas, the ISSF Academic and Research Programs Committee will be supported by the ISSF Technical Director and by the chairpersons of the ISSF Technical Committees.

The pre-selected proposed studies with relevant allocation of funds and justification of proposed type of procurement (open competitive tender, restricted competitive tender and non-competitive tender) and justification, will be submitted to the approval of the ISSF Adjudication Committee, which is the internal ISSF body responsible that proposed procurement actions for R&D studies are in line with the ISSF established rules and policies. The Adjudication Committee is composed by three individuals nominated by the ISSF Board. Following the deliberation of the Adjudication Committee, an Invitation to Tender will be issued for each selected study. The ISSF Tender Evaluation Board, which is nominated annually by the ISSF President, will supervise the preparation of the Invitation to Tender, evaluate the proposal submitted by prospective contractors, and make recommendations to the ISSF President for the approval/disapproval of the draft contract. Finally the ISSF President will sign the contract and authorize spending. The management of the study contract execution and the review and approval of all contractual deliverables at the scheduled progress milestones is responsibility of the ISSF Academic and Research Programs Committee.

As a variation to the above process, for expensive R&D tasks the ISSF may decide to provide only partial funds (co-funding). In such case the procurement process followed is the same as above except that instead of a contract a suitable formal agreement will be established between the funding parties.

### **4.2.2 Grants**

The Foundation will make grants toward the objectives of its programs. The Foundation grants spending is managed by the ISSF Executive Committee in accordance with the annual amount of resources allocated in the ISSF Budget. Grants requests (external)



and grants proposals (internal) are compiled and pre-selected by the ISSF Executive Director on a quarterly basis. The candidate grants list will be submitted to the approval of the ISSF Grants Committee, which is the internal ISSF body chaired by the ISSF President responsible for ensuring that pre-selected grants requests and proposals are in line with the ISSF established rules and policies. The Grants Committee is composed by three individuals nominated by the ISSF Board.

Following the deliberation of the Grants Committee, the ISSF Executive Director will manage the release of funds via the ISSF Treasurer and will maintain the relevant official documentation.