PMWorldToday

Published in ***PM World Today*** – August 2009 (Vol XI, Issue VIII)

PM WORLD TODAY – SECOND EDITION – AUGUST 2009

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Project Financing and Risk Management: a new challenge for program management in the space industry of the third millennium

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Abstract

Space is a risky environment. Satellite ventures are consequently risky businesses. Commercial applications of space is becoming the primary focus of most space enterprises and their demand for *better, faster and cheaper* project management, imposes a radical change in the awareness of the overall organisation with respect to risks.

When applying project financing schemes, a risk conscious attitude by the performing organisations is seen by financiers as a pre-requisite for a successful venture. Risk and opportunity management methodology is consequently gaining the attention of the space industries.

Risks in Project Financing

The term Project Financing refers to a wide range of financing structures where the provision of funds is not primarily dependent upon the credit support of the sponsors or the value of the project's physical assets but on project's capacity to serve the debt and provide an equity return to the sponsors through its cash flows. Project finance involves the setting up of an "ad hoc" project company (called Special Purpose Vehicle - SPV) to carry out the venture. The SPV is capitalised through equity and debt funding which is used to cover project capital expenditures and pre-operational costs; once the project is completed, the SPV can start its commercial activities thus generating the necessary cash flows to repay the financing.

Risk management is key to any operation of satellite project financing as it ensures the completion of the system on time, to budgeted cost and the delivery of service in line with expected standards. As cash flow generation depends on all these variables, financiers are

closely concerned with the feasibility of the project on its whole and with the way to manage the impact of potentially adverse factors.

A successful financing structure for satellite projects entails a balanced allocation of project risks among the various interested parties. These risks must be fully understood by all involved parties and must be properly mitigated.

In satellite project financing the nature and level of risks vary during the life cycle of the project and fall into three broad areas: regulatory, completion and market. Regulatory and completion risks may arise during investment phase, while market risk is associated with the operational one.

Regulatory Risks

Regulatory is the risk of not obtaining all approvals required to build (e.g. export licences) and operate (e.g. orbital slots assignment and frequency coordination, landing rights) the system.

Export licences from United States are a very clear example of this kind of risk. On October 1998, the U.S. President signed the Storm Thurmond National Defence Authorisation Act, which required all satellites and related items be transferred to the United States Munitions List (USML) and controlled under the Arms Export Control Act. The consequent restrictions applied to the exportation from U.S. of space products and the long time needed to get final approval, represent a serious risk for satellite manufacturers. U.S. manufacturers' share of the market for geostationary satellite dropped from an average of 75% in the period '95-'99 to less than 40% in the first seven months of 2000 (Fernandez, 2000). Most of the U.S. manufacturers place a large portion of the blame on U.S. export controls.

Completion Risks

Completion risk is the risk the satellite system will not be completed within the established performance, schedule and cost objectives.

There are basically three ways of approaching completion risks in satellite project financing:

- by adopting proven technologies;
- by involving experienced system's manufacturers; and
- by defining an adequate contractual structure.

The use of unproven technologies or innovative technical solutions is never welcomed by financiers. Adoption of unproved technologies does not preclude financing innovative systems (e.g. Iridium and Globalstar) but decreases the likelihood such systems will be financed on a pure project finance basis. In addition to this, the involvement of established industry players with excellent track record will be a prerequisite to be met by the project in order to raise the necessary funds.

Financiers will examine carefully the contractual obligations of the contractor vs. the SPV and will require that certain provisions be contained in the relevant contracts.

The construction contract will have to be structured on a turn-key (In Orbit Delivery contract) / fixed price basis so that contract cost overruns are borne by the vendors. As vendors will accept to enter into such a contract only if system's requirements are well developed this will give the lenders an high degree of confidence that the system can successfully be completed.

Furthermore the contract will be structured around an *incentive payment scheme* which involves the contractor placing a portion of the contract price at risk (i.e. the contractor is paid a part of the contract only if the system meets performance criteria during its nominal in-orbit life). Clearly, the greater is the portion "at risk" and the level of performance required, the greater is contractor's commitment to the new system and, consequently, financiers' confidence in the venture.

Market risk

Market risk is the risk the target market will not materialise. In project finance this risk must be carefully assessed and mitigated; the most usual way of doing so is represented by the signing of "off-take agreements" between the SPV and its customers. An off-take agreement is a contractual obligation by a customer to effect a series of payments to the SPV, over a certain period of time, in exchange for certain products/services.

In traditional telecommunications satellite project financing, off-take agreements take the form of medium term transponder lease contracts between the SPV (operating as a wholesaler of satellite capacity) and a reputable customer. The rights of the SPV under these contracts will usually be assigned to debt providers who will therefore have a direct claim under them. If the right of the SPV under the transponder lease contracts are satisfactory to the lenders and can be assigned to them, the lease contract itself will be considered a valuable security and will be decisive to a successful financing of the project.

As it is indicated above not only the nature but also the level of project risks varies over the life cycle of a project (see Exhibit 1).

The investment phase comprises all the activities associated with the construction of project assets, i.e. (under a turn-key contract) the capital expenditures relating to the space segment, ground infrastructure and launch campaign. The investment phase starts with the so called "Financial closing" (i.e. when the financing contracts are finalised and the SPV is entitled to draw down the funds) and ends when project's assets are completed and the SPV starts commercial operations (i.e. generate revenues). In a telecommunication satellite project the completion of investment phase coincides with In-Orbit Delivery (IOD).

The financial exposure of the SPV increases throughout the investment phase and reaches its pick when all debt and equity funds have been drawn down. Once the system is up and running and commercial operations commence, the SPV starts repaying the financing thus reducing financial exposure.

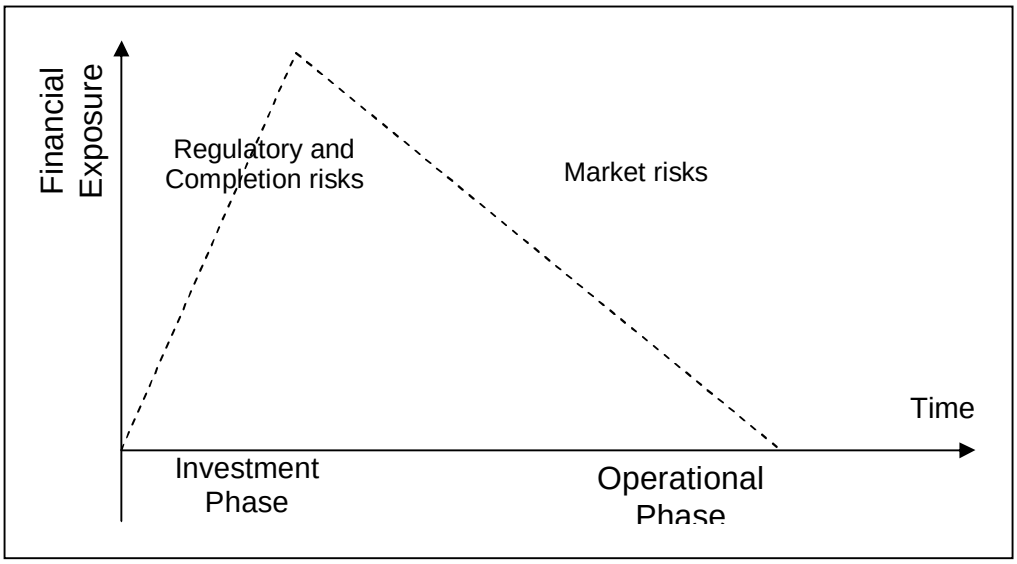

Exhibit 1: Financial Risk

Risk and Opportunity Management in the Performing Organisation

As seen before, manufacturers are requested to accept risk sharing during a significant part of the life cycle of the project. This commitment is usually requested during investment phase, primarily concerning the Regulatory and Completion Risks, but sometimes it is requested also during the initial operating phase. Very often, IOD contracts include in fact insurance coverage not only for launch failures, but also for satellite failure on orbit during the first 5 years of operation.

The project managers of the performing organisation (the manufacturer) are requested to interact with all the stakeholders of the venture: sponsors, financiers, customers, operators, insurances, etc. A critical facet of this activity is that the stakeholder perception of risk is usually very different. As stakeholder rate risk, disagreements may arise.

A risk conscious attitude by the performing organisations is seen by the financiers as a pre-requisite for a successful venture. Risk management techniques are becoming very popular in the space industry as an integral part of project management.

Risk Management is a systematic methodology to support program management in the optimisation of program resources with the purpose to *identify*, *assess*, *prioritise* and *reduce* the risks involved in a program. It is a *proactive* way (not reactive) to deal with potential problems. Risk analysis examines risks “before” they happen and provides an early warning for management. In recent years risk management is evolving towards a more integrated

Risk and Opportunity Management (R&OM). If no real opportunity exists, in fact, there is no reason to pursue a risky activity; however as a potential gain increases, so does the threshold for accepting risks (Pritchard, 1997).

What to do before using Risk Management

An effective implementation of R&OM is usually restrained by several barriers that shall be immediately identified and removed with the support of general management. Some of the most common barriers are:

- Technical arrogance and individualism of the engineering staff (engineers are mainly trained toward a strong individual technical excellence, while few of them receive education on team building and communication skill from the educational institutions)
- Information ownership linked to personal power (sharing of information shall be presented in the right perspective: as an additional resource for individuals when practised throughout the organisation)
- *Shoot the messenger* project manager's approach (R&OM is not likely to be successful if "*There is no risk in the project*" is the only acceptable response; project managers shall encourage and reward the risk messengers, rather than shoot them)

A proper R&OM policy shall be defined and shared throughout the organisation. Extensive education (theory) and training (practice) of management and personnel shall be provided. Only when proper *environmental* conditions are established the R&OM process can run properly throughout the organisation.

The R&OM Process

The R&OM process includes the following fundamental steps:

- *Risk and Opportunity Identification*;
- *Risk Quantification/Assessment*;
- *Risk Response Development*;
- *Risk Monitoring*, *Communication* and *Acceptance*.

A brief overview of the methodologies applied in our company is reported hereafter. A more detailed description is provided in (Gerosa, 1999).

Risk Identification

This step is of paramount importance in the frame of R&OM. It does not matter how good the Risk Assessment or Risk Response Development are, if you have not identified the key risks that are going to affect the project then R&OM is worthless.

Several techniques are available to assist in risk and opportunity identification: expert interviews, analogy comparison, independent technical assessment, etc..

The following combined approach has been found very promising when used at Alenia Spazio: each element of the project Work Breakdown Structure (WBS) is explored by means of brainstorming techniques in search of potential risks (and opportunities) in several areas (technology, requirements, manufacturing, verification/integration & test, development status, team experience and availability, planning, supplier, customer, contractual and legal, financial). Check lists as well may be used to improve the brainstorming results.

Risk Quantification/Assessment

The purpose of this step is to determine the magnitude of the individual risks and to rank them with respect to *Cost*, *Schedule* and *Performance*. To this aim it is necessary to determine the probability of occurrence and the consequence severity of the events identified in the previous step as *Risk Items*. In order to standardise this evaluation and to reduce possible subjectivity during the assessment, a set of reference tables (both for probability and for consequence) shall be prepared and shall be used throughout the project.

The *Risk Items* identified as possible source of risk for the program will be presented to one or more experts. A considerable help in performing this activity is to use the historical data from previous programs. Experts shall provide, for each one of the identified *Risk Items*, sufficient information to perform a statistical analysis.

The *Risk Items* are then classified by their magnitude. A proper threshold of acceptance shall be defined and all the risks whose magnitudes are above this threshold shall be reduced and controlled.

Risk Response Development

Proper actions for risk response development shall be defined and implemented in order to maintain risks within the *acceptable* level. Risk reduction effectiveness shall be continuously monitored and verified.

The techniques for reducing or controlling risk fall into the following categories:

- ***Risk Avoidance****:* it shall be noted that not every risk can be wholly avoided and that an action that avoids one risk can simply transfer that risk to another area.
- ***Risk Reduction****:* it can be implemented by both:
  - reducing the probabilities of the undesired event (*Preventive measure*)
  - reducing the consequence of the undesired event (*Mitigation measure*)
- ***Risk Transfer/Deflection****:* it is a means of deflection by which all or part of the risk is transferred to another party by some form of contract (i.e. insurance, sub-contractors). Typical examples of this are the insurance coverage for the satellite launch and the application of penalty schemes to subcontractors in case of delay in delivery of the components (or other protecting clauses in the relevant contracts).

- ***Risk Retention**:* A risk can be considered acceptable when its magnitude is less than a given threshold. Risk retention is an acknowledgement of the existence of the risk and an assumption of the consequences if a failure occurs.

R&OM is an *iterative process* to be applied during the whole life cycle of the program in order to reflect its evolution and to verify the implementation of the risk reduction actions. A risk reduction action can in itself create further *secondary risks* that should also be identified, analysed and reduced. In addition, any changes made to the program, such as requirement changes, will change the risks and will create new risks.

Risk Monitoring, Communication and Acceptance

Risk information shall be properly documented and communicated to all the stakeholders of the project. The use by the performing organisation of a risk data base, to take memory of the past experience, is a key element to assure improvement of technical performances and savings of resources in terms of time and cost. The mysterious nature of lots *rules of thumb* concerning good design and proper processes is usually the result of improvements obtained by past generation of designers and technicians not documented properly. We must be careful not to repeat this mistake and make sure we document the reasons along with the lesson learned.

Eventually all residual risks shall be subjected to formal risk acceptance by the project manager.

R&OM Throughout the Project Lifecycle

The relative weight of the different steps of R&OM vary with time, and is strongly related to the trend of risk causes and risk effect manifestation throughout the project lifecycle, as depicted in Exhibit 2. Most of the risks are generated in fact early in the project life, but the consequence of these risks usually emerge very late, with disruptive effects. If the risk reduction strategy is not implemented at the proper time (i.e. early in the project), the time passing will prevent any strategy to work efficiently. A typical example is the dramatic impact that design problems have on the project. As a consequence of this behaviour, the relative weight of the four steps of R&OM vary as depicted in Exhibit 3.

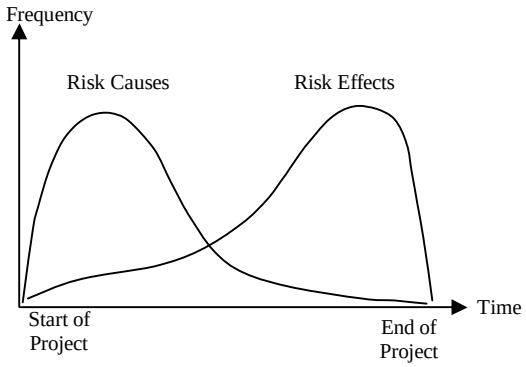

Exhibit 2: How Risks emerge during the project lifecycle

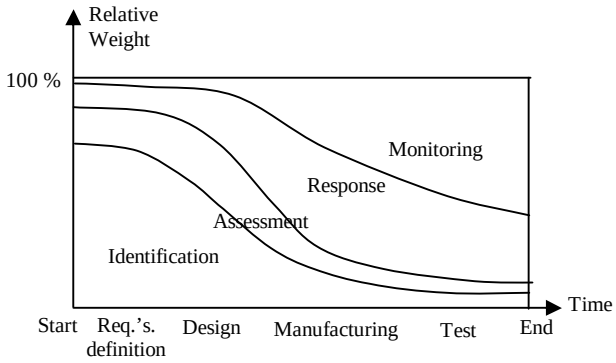

Exhibit 3 Risk Management Steps Relative Weight During Project Lifetime

Conclusions

Most of new commercial satellite projects are implemented under a project financing scheme whose feasibility is dependent on project's performances. Debt and equity funding is provided to the extent it can be properly serviced through the cash flows of the project. As a consequence financiers shall be considered as new primary stakeholders, in addition to the traditional ones. They are becoming more and more familiar with the space industry environment and their attention to the problems of satellite ventures is raising their depth.

As a consequence application of Risk and Opportunity Management methodology is becoming a must for the space industry of the third millennium.

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