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Space technology transfer problems in the context of protecting the space heritage

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ABSTRACT

The paper concerns space technology transfer issues related to patent protection challenges in space sector. Inventions in the field of space engineering continuously constitute significant part of the innovative space market. The protection of intellectual property not only is extremely helpful in cooperation in international and multi-entity projects but also may become a stimulus for further terrestrial and extraterrestrial business opportunities. The variety of space technologies, restricted space market and unique knowledge proved in the space environment, requires special treatment in the context of intellectual protection. The technology transfer process, which consists of extracting and marketing space technologies, services and applications, for a purpose which were not originally intended, requires also a new approach in the context of patent policy.

Issues like space patent paradox, space requirements and the consequences for the market, as well as transfer of space technology to non-space applications and finally, space exploration and benefits for mining industry on Earth, have been discussed.

1. Introduction

Space technology transfer process is different than in fields or technology. The difference is caused by significantly higher investment costs, atypical requirements that space equipment has to meet, the need for dedicated infrastructure and highly specialized human resources – namely engineers. The number of patented space applicable invention is increasing, despite the fact that this form of IP protection has been so far not as common in space industry as in other sectors. Traditionally, in the space industry it was the space heritage, the reputation of being of reliable contractor and confidentiality that decided whether contracts were won or not. Consequently these qualities naturally were more taken care of than the patent protection. Present paper concerns issues related to the space technology transfer specificity and the meaning of the patent in space sector, namely:

- (i) space patent paradox,
- (ii) space engineering requirements,
- (iii) space-related inventions and the utility scale of application,
- (iv) transfer of space technology to non-space applications,
- (v) space exploration prospects and protection of the way of taking samples from extra-terrestrial bodies.

2. Space patent paradox

Patent protection is based on an economical principle that if the inventor or his successor in title is granted a time limited monopoly in exchange for disclosing his invention to the public, then the technological development is faster and economy grows. The monopoly must be guaranteed in a legal system and legal systems are geographically limited – most often to single countries. Hence, patent right is also by definition geographically limited. Also the idea of transaction “monopoly-for-disclosure” requires further constrains regarding the invention, so that the system could work properly. In most legal systems those constrains are: novelty (invention has to be new – not disclosed previously), inventive step (invention has to be non-obvious) and industrial applicability – or similar ones. Additionally for maintaining protection additional fees are charged. Fees are periodical, typically annual and increasing in time. It is a part of the system to make it inviable for patentee to maintain an exclusive right for a product that is not on the market and that does not make money for him.

Although often legal acts do not provide a definition of the term invention, it is quite universally acknowledged that invention is a solution to a technical problem. It usually is one of following categories: a device, a product (substance), a use, or a process (a method). In some legal systems there are also specified additional categories. In other

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some are limited. The category of the invention affects the possibility of enforcement of a patent as the monopoly given by the patent is given for invention and defined by patent claims. Patent claims are formulated to cover particular categories. Generally, monopoly refers to commercial use or introduction to the market. Hence, categories of invention indicated in patent claims are somewhat limiting and also crucial for evidencing and determination of the patent infringement. For example evidencing of infringement of the device claim usually consists in buying a product - device, disassembling it taking photos and labelling features indicated in the claim. If all features of claims are identified in the product then infringement is proved.

On the other hand evidencing infringement of a claim directed to method requires observation or obtaining detailed information regarding details of certain process executed commercially by the assumed infringer.

A tricky part of the patent system is that a person applying for a patent (Applicant) has to disclose his invention before patent is granted. It cannot be “taken back” and it is disclosure (patent application) what is examined to determine if all conditions for patentability are met. It means that patenting involves risk of giving away the invention “for free”. That risk is highly deterring in sectors in which confidentiality is default mode of protection. Space industry is one of them. In fact space industry is even trickier. A patent's coverage is limited to the particular territory that issues the patent. However, outer space is no one's territory. There is no Space Patent Office or Space Patent Court. Furthermore, there is no legal system that would allow patentee to enforce patent in extra-terrestrial space. On the first thought it seems to be a space patent paradox as applicant would disclose invention and obtain no protection for the field of application that is most important to him.

However, it must be considered where is the money in space industry and what are the principles of its flow/distribution. It should be observed that space instruments and devices are manufactured on Earth and in the limited number of countries. Suppliers of those devices receive either public or private funds for their products and often compete for the orders from the agencies. It leads to quite obvious conclusion that although space devices are applied in space the money in them can be made on Earth and in quite specific locations. Patent protection provides possibility to win some of the orders by ruling out the competitors if the patent protection covers these very locations.

It should be pointed out that actions taken in space can also bring significant commercial benefits and yet space is excluded from patent protection. It is a challenge for international space law to find an answer to the question, whether that situation increases or decreases the development of space technologies. Should it be the latter the problem can be solved by ratification of international treaties [5]. Space Patent Office or Space Patent Court sound rather peculiar now but it may be a way to speed up the space industry.

3. Space requirements and the consequences for the market

Usually, requirements in the space sector are very high; specific conditions in space cause that products are characterized by unconventional engineering solutions - in the field of mechatronics, optics, electronics, engineering, physics. It is a truth quite universally acknowledged, that space dedicated mechanisms have to be lightweight and durable, and particularly extremely reliable. It is a simple consequence of high cost of placing devices in outer space with barely any possibility of servicing them. Simultaneously, space equipment is subjected to unique and extreme conditions. Main factors that might affect space mechanisms are high vacuum, extremely low temperatures (even -160°C) and micro-gravity conditions. The development of reliable mechanisms working in space requires very good knowledge of that environment, assessment of risks, use of modern technologies and extensive testing. The lack of atmosphere results in non-existent convection of space. Cooling of space mechanisms is substantially based on

heat radiation. Therefore, despite ambient temperature so extremely low that it changes mechanical parameters of metals overheating still may be a problem. This effect combined with the possibility of exposition to the radiation of Sun extends effective range of operating temperatures for the space equipment to more than 200° .

On the one hand, variety of technologies and space market, on the other unique knowledge proved in the space environment, requires special treatment in the context of intellectual protection and patent policy. Patenting such technologies gives a prospect for inventors and applicants to obtain just and fair reward for their contribution that prove to be useful not only in space. The main challenging task for space IP protection is to prepare the patent application with broad scope of protection and coordinate prosecution in coupling with process of identifying the actual products and market opportunities while simultaneously limiting the scope of protection to remedy objection with respect novelty or inventive step risen by patent offices. That requires specialists with open mind and understanding not only of the interdisciplinary invention but also the market strategy applied by the applicant.

Patent protection policy is influenced by several factors:

- (i) Patent for space equipment gives monopoly for the entity to be commercial provider of such equipment for space missions;
- (ii) Patent is recognised as being prestigious. It shows the financial engagement.
- (iii) Patent law has provisions for rewarding the inventors and enforces establishment of codified relations applicant-inventor.
- (iv) Patent law is well suited for technology transfer. Hence it facilitates reuse of space inventions in terrestrial applications.

SME may be interested in starting a new space business, expanding an existing business (extending territory or changing the focus) and thereby improving its market position. In many situations, licensing of intellectual property rights is an effective tool for achieving business goals, or even it is the only possibility in terms of international contracts or applying for space agencies tenders. In the international context, a formal licensing agreement of space technology is reasonable only if the intellectual property right to be licensed has a territorial scope that covers all the countries involved. Should there be otherwise, the licensor would not only be able to enforce an exclusive right against third parties and the licensee might not be willing to accept the situation in which he would be obliged to pay for the technology that is free to other entities.

Last but not least reason for patenting space inventions is the fact that they are not only applicable in space. There are many inventions that were initially dedicated to space applications but in time proved to have huge market potential in everyday life and common industry – Light-Emitting Diodes (LEDs) and memory foam, to mention just the two.

4. Space technology transfer – terrestrial applications

Space technology transfer is different than in other branches of R & D, due to very high investment costs, special requirements for space technology, and the need for dedicated infrastructure and highly specialized engineers. The most efficient innovations often derive from using existing technologies for purposes unrelated to their original applications and assignment.

A very important and promising channel of commercialization of research results and achieving the benefits of intellectual property protection is the use of space research knowledge to terrestrial, non-space applications. Space technologies are the reservoir of innovation; numerous interesting applications of technology or materials that had initially been developed for space have proved to be successful in common life application.

Space exploration has created new markets and new technologies

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