IMPROVED PERFORMANCE IN MARS SAMPLE ACCESS. I.D. Alberto Soto, Center of Research of Industrial Design UNAM (albert.soderstrom@gmail.com)

Introduction: The rover ability to reach anticipated locations to search samples on Mars can determine the constraints of the mission, while improving surface mobility rover in various fields increases the ability to collect samples, it should consider as part of an accessibility system, also determined by the mobility of tools for measurement. That's why the improve of suspension and robotic arm should be considered part of an accessibility system where both affect the sample access performance.

The following proposals are based on the acquired knowledge about the mobility of rovers in previous missions, searching improve this system without losing sight of cost reduction in developing it.

Evolution of systems: Three rovers missions on the surface of Mars have allowed us to understand the capabilities of displacement system and current needs for global access improvement in the Martian soil. Taking the current system as a reference point and evolve it to meet the new expectations of the mission, we can avoid the delay and the cost of trying entirely new systems. Similarly, the use of proven systems on the ground that respond to situations similar to those raised as a reference for improving the rover can reduce the cost of research and put ourselves in a situation of improved systems, rather than creating from the sketch. .

Access to samples: In previous designs of rovers the ability of use measurement tools has been fully committed to the field position the rover, increasing the operations to position the arm near to reach the desired sample, duplicating the work of the control system as a part of the operations performed to take position in the right place, also to rid obstacles of geography. Added to this, there are many scenarios where it is impossible to reach for sampling with the current configuration.

That is why increasing mobility and autonomy of robotic arm that supporting measurement tools is crucial to consolidate a global system access.

Robotic arms: The proposed solution to this issue is to mount both the tools and the cameras in mobile arms of 3 parts (like the present) and place them on top of the rover and increase the length of the sections, thus achieving access to places previously impossible (Fig.1). By putting the camera as the tools in mobile arm this may monitor more closely the sampling arm so it may save precision required to approach the samples, subtracting responsibility to displacement system.

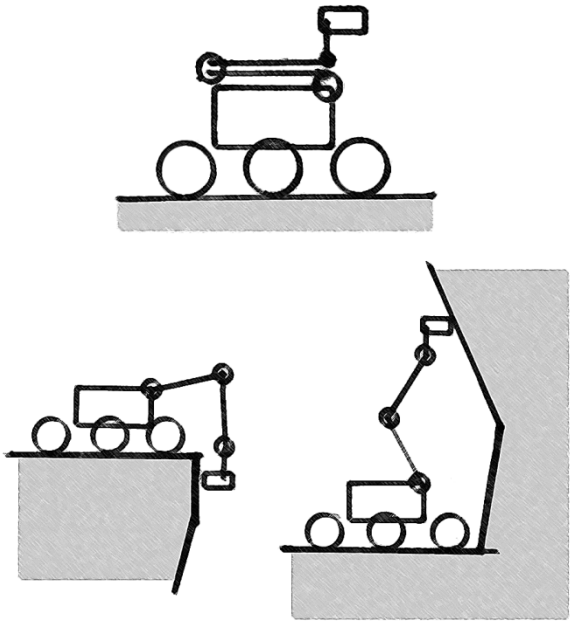

Fig.1

All terrain: Two aspects must be considered for this purpose, improved suspension and improved wheels. The current suspension has proved its capability in rough terrain situations but as the descent and ascent in craters or hills is an issue that still causes uncertainty and fear about the possibility of overturning of the vehicle. A relatively simple solution to this problem is to provide the ability to extend the axis of the rear wheels to give more support and prevent tipping when climbing a slope, or equally when it descends when driving in reverse (Fig. 2).

This of course complemented by improvements in the design of the wheels, which until now has been developed independently of the design trends in wheel all-terrain vehicles for atmospheric and weather conditions on the planet so specific, however a wheel developed for this variety of terrain and tested will be the starting point for the design of the rover wheel, using composite materials in order to save the impossibility given the atmospheric conditions of the use of tires. The conjunction of solutions offer a scenario where the transit of the Martian surface can occur in a more secure and thus may increase the speed of this, reducing the time currently necessary to the accomplishment of their tasks.

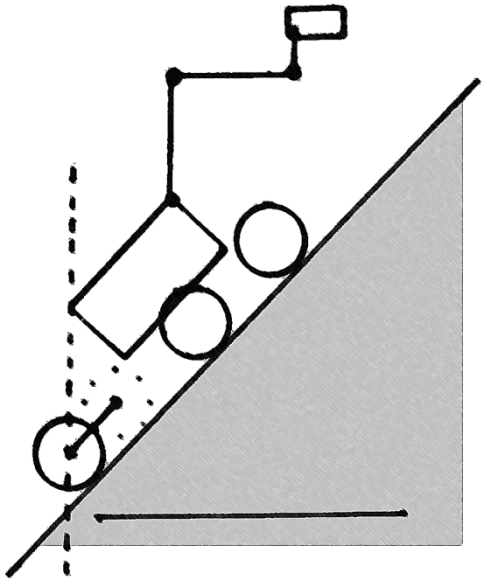

Fig 2.

Impact in performance: A more robust system with the possibility of reaching any sample and increasing the travel speed significantly affect the efficiency of the rover, and may also positively affect the scope of the mission. A more agile and reliable rover may reduce the required missions to bring samples back to Earth, since being able to travel long distances on Mars may collect samples of various sources and remote environments, and can keep these for a subsequent mission to return these to Earth.

Extra: Other aspects to consider are some accessories that you can equip the rover to improve the tasks you can perform. For example, in the case of using these solar panels can be equipped with self-cleaning mechanisms Martian dust, extending the life of this. Moreover additional excavacion toolsas a "plow" could allow a very easy and fast access to samples at low depths. These are low-tech items that could well make a change in the overall performance of the rover.