Current status of technical development of the penetrator and its future prospect

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The penetrator is a missile-shaped instrument carrier, which is about 14cm in diameter, 90cm in length, and about 13.5kg in weight without attitude control system. It contains a two-scientific instruments -seismometers and heat flow probes together with other supporting instruments such as a tilt meter and an accelerometer. This has been widely noticed to become a future powerful tools to investigate internal structure of the Moon and planets, but technical difficulties, one of which is sustainability under high shock condition, were obstacles to gain a reliable position of space missions. LUNAR-A penetrator mission was approved in 1990, but it was ofiicially canceled in February, 2007.

We have reported some results of a three-year program which started from 2005 for the porpose of technical accomplishment of the penetrator technology. We have already performed two real-size penetration tests both of which obtained good results. A shock experiment of elemental parts, which consist of miniature shock triggered switch and electronics circuits, was performed in November 2005. And the next one was performed in 2006 -a QT level penetration experiment to confirm the integrated performance by adding the power reset system on board.

Our final confirmation is a penetration experiment of the flight model which has redundant system both for the power reset system mentioned above and communication margin. At present we have finished the operational experiment and found no mulfunction and excellent result of communication performance. The penetration experiment is planned in February 2008 at Sandia National Laboratory.

We have also started to deploy the penetrator to the future lunar and planetary missions so far. One possible candidate is the Russian lunar mission, LUNA-GLOB, whose launch is scheduled in 2012. In this mission, four LUNAR-A type penetrators are deployed by 3-axis stabilized satellite. We have started technical study from 2006 with each other, and finishede basic configuration and orbit design. As a whole, we obtained a high feasibility to realize the penetrator mission with the collaboration between Japan and Russia because of their high capability of attitude control at the deployment sequence of the penetrator and their past experience to deploy the Mars penetrator.