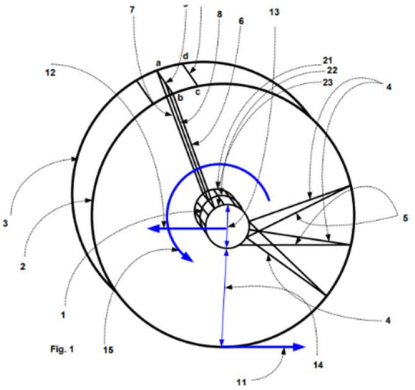
Two Low Cost Lunar Cargoes (2LCLC): OPLONAS and MACEDONAS. Charis KOSMAS. Author[1],[1]Lunar Cargo P.C., 19 El. Venizelou Ave., 16343 Ilioupolis, Greece, mailing address. (Contact: charis.kosmas@georing.biz)

Introduction: two Low cost lunar cargoes (2LCLC) takes advantage of the special morphology of the lunar surface (namely flat planes and crater rims) for delivering large cargo (**OPLONAS**) and regular parcels (**MACEDONAS**) respectively, through mechanical means, in the place of the "classical" chemical propulsion. An important aspect in both systems is that they also take advantage of the fact that there is no atmosphere around the Moon and so no trajectory perturbations due to atmospheric effects. Additionally the construction of MACEDONAS can be made possible by scavenging the material from OPLONAS. The savings which can be achieved are in the range of 70%, considering that currently all lunar landing vehicles have a net of 30% of the total



mass of the orbiting vehicle, the rest being fuel and associated thruster and structure mass .

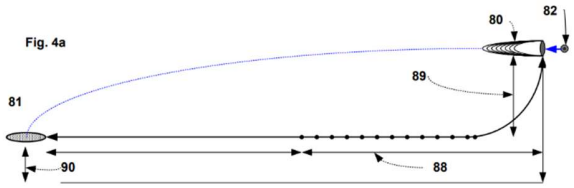
OPLONAS: (Oversized Payload Lander On Non-Atmospheric Somata) The spacecraft named OPLONAS is a 60 meters diameter wheel shaped spacecraft, consisting of a rigid, payload-containing cylindrical core of of 6 meters diameter and 6* Φ height and a flexible part which is deployed through spin motion, right before touching the lunar surface. With a rotational speed of 8.62 revolutions/sec the spacecraft will not suffer catastrophic impact upon contact with surface but it will roll and bounce for several 100's kilometres till it will dissipate all kinetic energy and eventually fall to rest. Important characteristic of the flexible part of OPLONAS is its construction by means of ZYLON® ropes, which is the only known commercially available material, capable of sustaining the enormous tension generated by the centrifuge forces, which will develop by the high rotational speed.

OPLONAS Characteristics

Minimal to no fuel needs. Can negotiate obstacles of up to 27 meters). Scale potential and evolvable.

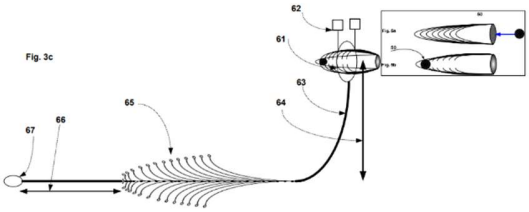
Mode of operation:

The core spacecraft is launched with the flexible part wrapped around. Uppon arrival to low lunar orbit (LLO) spacecraft spins up and deployes the wheel sole protetor of perimeter $2*(6*\Phi)^2$. Lands on a flat lunar surface (example Mare Imbrium), and dumps kinetic energy by roll friction along a long corridor. It makes available through scavenging, flexible elements material for making up MACEDONAS structures.



MACEDONAS: (Momentum Absorption Catcher for Express Deliveries On Non-Atmospheric Somata) MACEDONAS consists of a catcher, a central tether and a dendritic system designed to decelerate smoothly a parcel that may hit the catcher.

Operating Principle.



The **catcher** is an apparatus which resemples the batterfly catcher but having multiple (embedded) layers of nets chich can all but the last one be perforated by the parcel.

The **Core wire,** attached to the rim of the catcher, engages mechanically and follows the ballistic trajectory of the parcel.

The **dendritic system**, consisting of successive wire segments, which are engaged one by one, (as the catcher continues to fly) and decelerates parcel to zero velocity before it falls to rest on a safety net.