Conall DE PAOR

De: Conall DE PAOR
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À: Conall DE PAOR
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- Moneyball Newsletter -

Conall de Paor

31st of March 2024

March was the 3rd month of the Moneyball project. Also in March, Japan became the second country to attempt to launch a responsive space system. The launcher unfortunately experienced a rapid, unscheduled disassembly (RUD event) 5 seconds after launch. (Pictured below).

In this monthly newsletter about my PhD there are:

- Some nice pictures,
- A progress update about conferences, funding and reading.
- Meeting Log
- An outlook for the next month.
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Space One's KAIROS launcher exploding 5 seconds after launch on March 13th. It is a 4 stage (3 solid, 1 liquid) launcher capable of lifting 250kg into a 33°, 500km orbit. Its mission was to demonstrate rapid replacement of Japanese reconnaissance satellites.

PROGRESS REPORT

Describing the Design Space of Space Mission

This month, the potential of Houbolt questions to discretise the design space of mission architectures was investigated. By considering Houbolt questions as "dimensions" and the answers to those questions as "integers", we can construct a kind of vector space in which every space mission exists. Below is the first attempt at this.

Houbolt Questions		Decisions				
		Q1	Q2	Q3	Q4	Q5
Dimensions	Mission Data collection	Material Return	Direct measurement	Remote sensing		
	Level of Autonomy (E)	1	2	3	4	
	Communications Architecture	direct to Earth	by relay			
	Mission timeline	days	months	years	decades	
	Reusability	none	some	all		
	Number of Spacecraft	1	2	more		
	Launch strategy	single launch	multi-launch	single rideshare	multi-rideshare	
	Consumables	all cary	depoting	ISRU	depoting+ISRU	
	Staging	1	2	3	4	
Combinations				110592		

Example Missions							
Rosetta	Philae	Chang'e 5	SSR	Voyager 1	Luna 24	New Horizons	X37-B
3	2	1	3	3	1	3	3
3	3	3	1	2	2	3	1
1	2	1	1	1	1	1	1
3	2	1	2	4	1	4	3
1	1	1	1	1	1	1	3
1	1	2	3	1	1	1	1
1	1	1	2	1	1	1	1
1	1	2	1	1	1	1	1
1	2	3	1	1	4	1	1

Left: Constructing the mission architecture space with Houbolt questions.

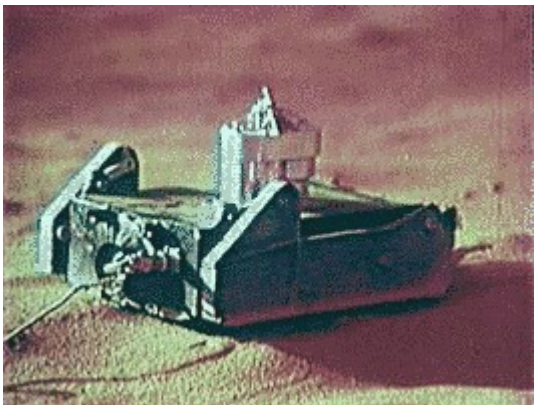
Right: Some well known missions expressed as vectors in the mission architecture space.

In this preliminary analysis, we can see that there are hundreds of thousands of possible space missions in this frame. The next job would be to make sure that all of the Houbolt questions are *independent* of one another, in order to find the minimum number of dimensions needed to describe all space missions.

Acceptance to *VIIth Space Resources Conference*. Krakow May 23rd - 24th.

A Moneyball abstract was accepted to this conference this week. The abstract title: *Moneyball - Finding Low-cost Mission Architectures for Space Resource Transportation Using Pattern Languages and Houbolt Questions*.

The project was also awarded a UNIVERSEH scholarship to attend the remote sensing solutions workshop alongside the conference. April and May will be spent preparing the outline of the Moneyball methodology to present it to peers and experts and to gather ideas for its implementation.

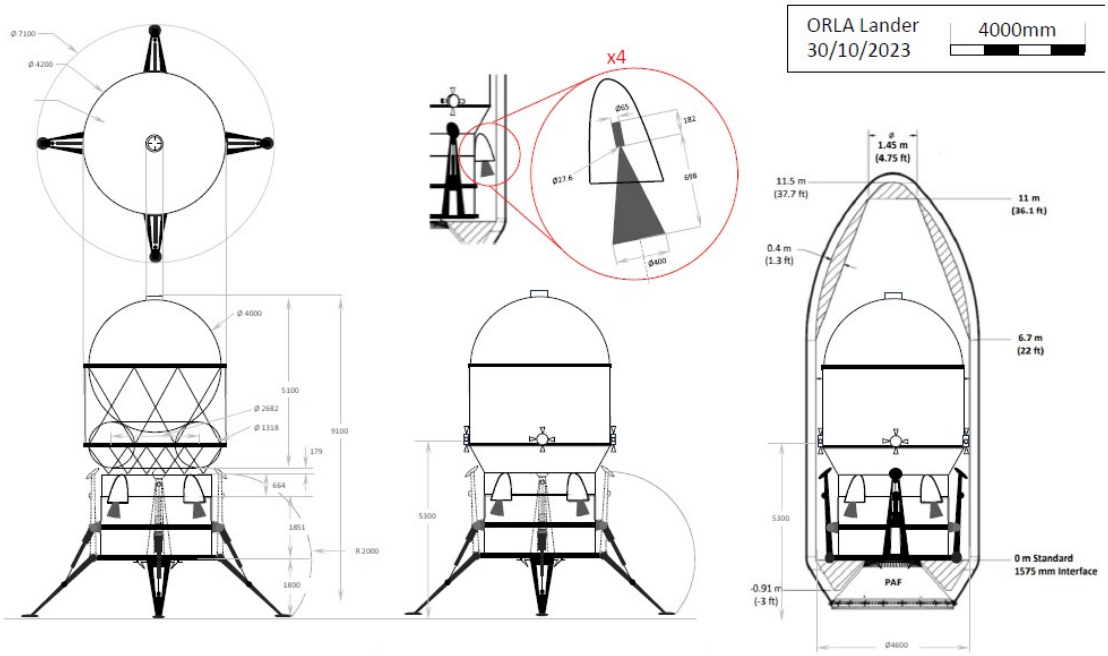


Unconventional solution. The Soviet PrOP-M mars rover. Proof that rovers don't need wireless communication systems or even wheels. It successfully landed on Mars in 1971 as part of the Mars 3 mission. Unfortunately, contact was lost 110 seconds after touchdown.

The ORLA Lander Journal Paper

At EUCASS/CEAS 2023 last year in Lausanne, my paper on Low-cost Lunar Landers, based on my master's research project, was well received. I was encouraged by Christophe Bonnal, President of the EUCASS Technical Committee to adapt it for publication in a Journal.

I have committed to completing it by June. There are quite a few things to do before it will stand up to peer-review: updating the lander database, re-sizing and re-calculating cost estimations and implementing feedback and corrections from reviewers.



The ORLA Lander presented at EUCASS 2023. Payload capacity of 2 tons. Total mass 24.3 tons. Apollo 15 LM for reference was 16.4 tons. Fits snugly inside a Falcon Heavy fairing.

Alten Supaero Joint Meeting

Monday the 15th of April is the provisional date for the 4 Moneyball supervisors joint meeting. There will of course be chocolatines and croissants. Exact Time TBC.

MEETING LOG

A log of all scheduled meetings had this month with their subjects. Informal meetings not included.

Friday 8th: Nelson Solana (BM):
Project catchup, space industry outlook in TLS.

Friday 15th: Professor Lizy-Destrez:
The Jeep Problem, Houbolt Questions, Launcher Architecture Sizing Tool (LAST) and Fast Aircraft Sizing Tool (FAST)

Friday 15th: Professor Sanchez:
The Jeep Problem, Houbolt Questions, QUELCE Uncertainty estimation.

Friday 29th: Professor Sanchez:
Acta Paper, Lit review Strategy, Knowledge gaps

OUTLOOK

The goals for April are

- Vacation 1st - 8th
- Prepare project for presentation in Krakow
- Investigate applicability of LAST and FAST to Moneyball
- Continue Literature review for IAC 2024 Acceptance notification on 12th of April.
- Joint meeting with SLD, JPS, JL, SM and CdP

That's the news for March.
Thank you for reading
Conall