# WHITE PAPER Tranquility Zoo

## A Managed Lunar Experiment-as-a-Service (EaaS) Business Model

## Executive intent

The Zoo is a low-drama, high-margin “nooks and crannies” revenue line: we accept small third-party payloads/experiments, integrate them into our habitat or nearby “garden” test area, provide power/thermal/comm/cameras, perform installation + routine care, and deliver data + observability back to the customer. We monetize via setup fees + monthly service + consumables + change orders, with transport mostly passed through.

The strategic bet: we become the only reliable caretaker inside an operational lunar site. That lets us price for risk reduction + scarcity + speed.

## 1) What exactly we sell

## Core service (minimum viable)

## Custody (secure storage + handling protocols)

## Power + comms (basic instrumentation and telemetry)

## Camera + signal (watch your “potato” grow)

## Routine ops (water/clean/inspect/reset)

## Incident response (limited troubleshooting + swap a part)

## Data delivery + logs (time-stamped, audit-friendly)

## Add-ons (where margin lives)

Precision thermal control

Sterile/biocontainment procedures

High-power pulses / motor drives

Sample handling / microscopy

Robotics/EVA installation

“Scientist-in-the-loop” experiments and interpretation

IP-safe “clean-room” handling + confidentiality wrappers

## 2) Reality check on lunar delivery pricing (why we treat transport as pass-through)

Commercial lunar delivery today is still expensive on a $/kg to surface basis. A widely cited commercial price is ~$1.2M/kg to the lunar surface (Astrobotic published pricing and payload user guides). Astrobotic+1 NASA’s Inspector General has noted NASA’s own planning figure was ~$1M/kg and that task-order reality trends closer to ~$1.2M/kg and potentially higher. NASA Office of the Inspector General

So: transport dominates unless payloads are tiny. Therefore, Zoo economics work best when:

the payload is small (sub-kg to ~10 kg), or

the payload is high value and wants care + data + credibility more than cheap transport.

(Starship could later collapse cost curves, but it’s not something we bank on in the near-term model.)

## 3) Pricing architecture (simple, defensible, and scalable)

## We charge 4 things

## Transport & lunar delivery: pass-through + handling margin

## Integration & onboarding: one-time NRE

## Zoo subscription: monthly recurring for care + ops + data

## Change orders/incident work: time & materials at premium rate

## The “scarcity logic”

You're selling:

## the only staffed/operated lab space in a hostile environment

## continuous attention (even if it's small)

## time-to-learning (faster than waiting for their own mission)

## risk reduction (your engineers touch it)

That supports pricing that looks "rich" compared to Earth, but is "cheap" compared to a failed lunar attempt.

## 4) Cost model (what it costs you to run each project)

I'm splitting costs into hard marginal and soft marginal.

## Hard marginal costs (real consumables)

Mass/volume penalty inside habitat ("rack space")

Power draw (kWh; but on the Moon this is life)

Water/thermal consumables

Data bandwidth / comm relay usage

Packaging, connectors, mounting hardware, test media

## Soft marginal costs (labor + overhead allocation)

Engineer time for integration

Ops checklists + daily/weekly tasks

Documentation + logs + data handling

QA/ESD/clean handling procedures

Customer interface + reporting

Key point: in your concept, engineers do this "inside regular duties," but we still bill it at a fully burdened rate, because it consumes scarce attention.

## 5) A practical “per-project” unit economics template

Here’s the template I’d use for first-pass pricing:

## A) One-time Integration & Onboarding Fee (NRE)

Covers: requirements, interfaces, mounting, safety, test, checklists, camera/instrumentation setup, procedures.

## Rule of thumb (range):

Micro (0.1–1 kg): $75k – $250k

Small (1–10 kg): $250k – $1.0M

Medium (10–100 kg): $1.0M – $5.0M

Large (100+ kg): $5.0M+ (usually becomes its own program)

## B) Monthly Zoo Subscription (MRR)

Covers: routine care + scheduled ops + logs + data delivery + basic troubleshooting.

## Rule of thumb (range):

Micro: $10k – $40k / month

Small: $40k – $150k / month

Medium: $150k – $600k / month

Large: custom

## C) Change Orders / Incident Work

Premium engineering: $350 – $650 / hour billed

EVA/robotic field ops: $50k – $250k per activity (depends on risk/time)

## D) Transport pass-through

If using current commercial delivery reality: ~$1.2M/kg to surface (plus integration fees, minimums, manifest constraints). Astrobotic+1

Important: for “nooks and crannies,” we’ll often be flying sub-kg to a few kg—so the transport line item is painful but tolerable, and the service value becomes the differentiator.

## 6) Example pricing packages (so you can sell it without drama)

## Package 1: “Potato Garden”

For tiny bio/ag experiments, materials exposure coupons, sensors, etc.

Payload: 0.5 kg

Integration: $150k

Subscription: $20k/mo

Transport (pass-through): 0.5 × $1.2M/kg = $600k

First-year invoice: $150k + $240k + $600k = $990k (~$1.0M)

## Your internal marginal cost guess (typical):

Engineer: 80 hours total/year @ $200/hr burdened = $16k

Consumables/power/comm allocation: $10k–$30k

Total marginal cost: $25k–$50k

## Gross margin on service portion (NRE+MRR): typically 70–90%

Transport mostly pass-through (add 5–15% handling margin quietly if you want)

## Package 2: “Instrumented Prototype”

For a small device that needs careful ops and data credibility.

Payload: 5 kg

Integration: $600k

Subscription: $90k/mo

Transport pass-through: $6.0M

First-year invoice: $600k + $1.08M + $6.0M = $7.68M

Marginal costs grow (more power/thermal/ops), but service GM can still sit 60–80% if you keep scope controlled.

## Package 3: “Scientist-in-the-loop”

You run an active experiment cadence + interpretation.

Integration: $1.5M

Subscription: $250k/mo

Plus: $50k–$150k/mo for specialist analysis/reporting

Typically $4–$7M service revenue/year per project (before transport)

## 7) How much revenue can we “cram into nooks and crannies”?

This depends on space, power, and engineer attention. So I’ll give a conservative “habitat slice” assumption:

## Assumed Zoo capacity slice (placeholder)

Rack/bench capacity: supports 25 concurrent micro/small projects

Engineer attention: ~2 FTE equivalent spread across ops shifts

Power budget slice: enough for sensors/cameras + small devices

## Scenario A: Conservative (quiet, low disruption)

10 new projects/year, mostly micro

Avg service revenue per project (NRE+first-year MRR): $350k

Annual service revenue: $3.5M

Marginal cost (labor+consumables): ~$1.2M

## Service gross profit: ~$2.3M/year

Transport is pass-through; it can be huge in invoices but not the profit story.

## Scenario B: Base case (real traction)

25 projects/year mix micro/small

Avg service revenue per project: $700k

Annual service revenue: $17.5M

Marginal cost: ~$5–$7M

## Service gross profit: ~$10–$12M/year

## Scenario C: Aggressive (you become the default caretaker)

40 projects/year; several “Scientist-in-loop”

Avg service revenue per project: $1.2M

Annual service revenue: $48M

Marginal cost: $15–$22M

## Service gross profit: $26–$33M/year

These numbers are plausible because the work is scarce and high-trust, and because customers already accept “moon economics.”

## 8) What we should charge “net of expenses” (your direct question)

If you want a single, simple rule you can repeat internally:

## Target unit economics

## Service gross margin target: 65–85% (NRE + MRR + change orders)

## Transport margin: 0–15% (usually low margin to avoid drama)

## Net contribution margin (after direct labor + consumables):

Micro projects: $200k–$600k contribution in year 1

Small projects: $0.8M–$3M contribution in year 1

Scientist-in-loop: $2M–$6M contribution/year

If you want to keep it “not a big deal,” you price it as a standard service menu with a strict scope box, and you only upsell change orders when they ask.

## 9) The “hidden” strategic value (why this is worth keeping in the white paper)

The Zoo creates:

A pipeline of partners + scientists + future tenants

A reputation for operational competence (rarer than rockets)

A natural place to embed Tranquility standards, telemetry formats, and “how-to-run-on-the-moon” playbooks

Optionality: today it’s potatoes; later it’s serious paid validation for high-value lunar industrial workflows

## 10) Next step (no big deal; just makes the estimates tighter)

If you paste your best guess for the Zoo slice (even rough):

how many concurrent projects you’d tolerate (10? 25? 50?)

how many engineer-hours/week you’ll allow

power slice (kW) you’re willing to allocate

…I’ll turn the above into a one-page pricing sheet + a 2-page unit economics appendix with a clean table you can reuse in proposals—still “quiet,” still deniable, still inside a white paper.

If you don’t want to refine anything yet, the base-case headline you can carry forward is:

“Zoo services can plausibly contribute ~$10–$12M/year gross profit at modest scale (25 projects/year), with invoices much larger due to transport pass-through at ~$1.2M/kg.” Astrobotic+1