PILOT PROPOSAL

Evidence-led validation of an integrated robotic motion system

PREPARED FOR		**PREPARED BY**	Maiden Robotics, Bengaluru
PILOT TERM		**STATUS**	

The proposal in one sentence

Maiden Robotics proposes a structured pilot to determine whether its integrated actuator system is suitable for the Partner's intended application, identify what must be refined before deployment, and generate objective engineering evidence for the next development decision.

What we are building and where it leads

Maiden is developing the foundational motion layer for industrial robots, humanoids and intelligent machines as a complete motion platform not only a mechanical joint. Each system brings together the motor and transmission, bearings, magnetic position sensing, motor controllers and embedded electronics with real-time control software. Partner-facing tools will include an SDK and MATLAB interface for commanding the system, recording position, speed, current and temperature data, and generating consistent engineering plots and validation reports. The eventual aim is a modular, manufacturable family of motion systems - supported by a consistent hardware and software stack, that can scale across robot classes and operating environments.

How this started and why we built it

While building robotic systems ourselves, we repeatedly encountered the same difficulty: selecting and procuring the right actuator. The available choices often sat at two extremes – either reliable but prohibitively expensive products from established international manufacturers, or lower-cost imported alternatives whose specifications frequently emphasised peak torque rather than the continuous or rated performance at which robots actually operate. Evaluating a single actuator could require hours of interpreting translated documentation, reconciling incomplete specifications and determining whether the stated performance was relevant to the intended duty cycle. After selection, inconsistent quality, limited technical support, long shipping timelines, customs procedures and import dependencies created further uncertainty.

An actuator is not merely another component; it determines much of the robot built around it. Its torque, speed, mass, dimensions, efficiency, thermal limits and electrical requirements directly affect the mechanical structure, battery selection, control architecture and overall performance of the machine. These consequences multiply across every joint: a typical humanoid may use approximately twenty-one actuators, while a six-axis collaborative robot requires at least six. A poor selection at this level can therefore require substantial redesign across the entire system.

We also experienced the gap between simulation and physical implementation. A design that appeared viable in CAD or MATLAB often required several hardware iterations once assembled and tested. Where an actuator could not be readily customised, characterised or supported, a three-month development programme could become a six-month programme or extend beyond a year.

We started Maiden to reduce this friction: to make actuator selection more transparent, procurement more dependable and physical iteration easier for organizations and Institutions. The purpose is not simply to produce another actuator, but to give engineers reliable performance information, accessible technical support and the flexibility required to move from a theoretical model to a functioning machine. This avoids restating the product architecture, SDK features, company introduction and long-term "Made in India" objective covered under the other headings.

Who we are

Maiden Robotics was founded us, Rhitam Dutta and Aditya Sapra, as long-time friends who studied and lived together through university and share a practical, builder-led approach through-out their internships, projects and research's.

Rhitam has spent more than three years developing autonomous rovers and research-grade exoskeleton systems. He led his university rover team to runner-up at the International Rover Challenge in 2025 and first place in 2026. His work includes robotics research published through IFToMM in Italy and IC2E3, patent filings relating to robotic designs, and firmware development undertaken with the University of Queensland. His experience spans systems architecture, control, prototyping and the physical validation of robotic machines.

Aditya brings experience across software engineering, building parallel CUDA based operations and applied artificial intelligence. While at university, he built a high-frequency trading engine from first principles, commercialised a side project to support his tuition, won ISRO's national hackathon and received recognition from the President of India. He subsequently participated in Google Summer of Code 2025 and worked at Atlan, where he helped ship AI-agent systems used by Fortune 500 organisations. Before graduating, he had accumulated approximately twenty-four months of professional engineering experience.

Together, we combine physical robotics, embedded engineering, control systems, software infrastructure and developer tooling. Maiden's approach is grounded in building, testing and learning from real systems: define the system requirements and develop the complete hardware coupled software stack. We measure its behaviour under extensive conditions, and refine any element that is under-performing or reduce anything unnecessarily over-engineered.

At Maiden we are currently developing our first actuator platform and projecting to engaging with IITs, universities, research organisations and private laboratories for structured pilot validation programs. The company's immediate objective is to establish reliable technical evidence, improve the system through real application feedback, and determine the engineering work required before broader deployment.

Why this pilot matters

The purpose of the pilot is to determine whether Maiden's actuator system is technically suitable, integration-ready and capable of progressing toward deployment in the **Partner's intended application**. It is not intended to be a controlled product demonstration in which only favourable results are presented. It is an engineering programme designed to identify what works, what does not, and what must change.

For the Partner, the pilot could be a task to evaluate the actuator against an agreed application before making a broader technical or commercial commitment. **The Partner will receive documented test results, integration findings, identified limitations and a clearer understanding of the conditions under which the system may be used safely and effectively.**

For Maiden, the pilot provides application-specific evidence that cannot be obtained through internal bench testing alone. It allows us to determine whether any part of the system is under-engineered, over-engineered or incorrectly configured for the industries actual operating requirements.

The pilot will help answer questions such as:

- Does the actuator deliver the required continuous torque and speed?
- Is the system carrying unnecessary mass, size or thermal capacity?
- Is electrical power being converted into mechanical output efficiently?
- Are current draw, heat generation and battery demand within acceptable limits?
- Is the mechanical system sufficiently stiff, durable and precise?
- Does the magnetic sensing provide the required accuracy and response?
- Does the motor controller perform reliably across the intended duty cycle?
- Can the SDK and MATLAB interface be integrated into the Partner's workflow?
- Are the available commands, data outputs, plots and reports sufficient for development and validation?

Where a requirement is not met, Maiden may refine the motor selection, transmission ratio, mechanical geometry, bearings, sensing arrangement, controller parameters, firmware or software interface before repeating the relevant test.

Where the system exceeds a requirement by an unnecessary margin, Maiden **may** evaluate whether weight, power consumption, size, complexity or cost can be reduced without compromising safety, reliability or performance.

What the pilot should establish

The pilot is intended to produce a traceable determination of:

- What is already fit for the intended application;
- What requires modification or further validation;
- Whether any part of the system is unnecessarily over-specified;
- What performance and operating limits apply;
- What safety and integration conditions must be observed;
- What engineering work remains before deployment; and
- Whether the Parties have sufficient evidence to proceed to the next stage.

A successful pilot does not necessarily mean that every initial target has been achieved. It means that the Parties have obtained reliable evidence, understood the remaining risks and reached a defensible decision to proceed, refine the system, narrow the use case or stop.

Pilot purpose and boundaries

- Purpose: validate technical fit, integration feasibility, measurable performance and principal risks for one defined use case.
- Not a production qualification, product sale, exclusivity commitment, guaranteed certification, or promise of future supply.
- Separate documents: any letter of intent, manufacturing partnership, design partner agreement and mutual NDA remain independent and are not created or replaced by this proposal.

How Maiden runs pilot programmes

The pilot is a staged development program. Each stage closes only when its evidence deliverables are reviewed by both sides. A failed metric is not concealed: it becomes an anomaly, corrective action, revised limit or stop decision.

Proposed technical baseline

- Pilot article: integrated actuator / joint prototype configured to the agreed load, speed, mounting, electrical and environmental envelope.
- Illustrative current architecture: one fixed-ring planetary reduction stage; CAD and assembly-clearance checks complete for the present prototype geometry. All operating claims remain subject to physical test.
- Partner interface: Mechanical envelope, bus and power limits, controls interface, mounting loads, environment and safe operating constraints documented at C0.

Checkpoints, evidence and decision gates

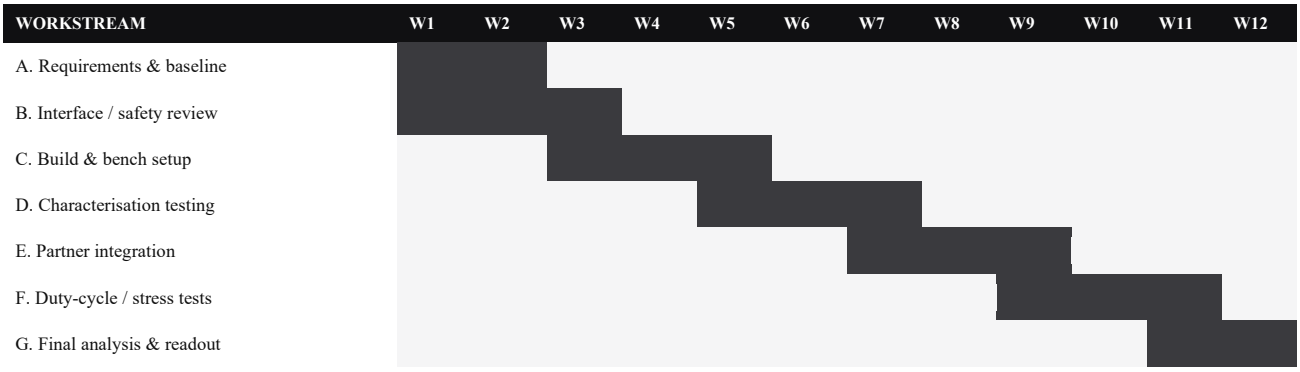
STAGE	VALIDATION	DELIVERABLE	DECISION
C0 - Kickoff	Requirements, use case, interfaces, baseline and safety constraints frozen.	Approved Pilot Plan; risk register; test matrix.	Proceed / revise
C1 - Design readiness	CAD/interface review; analytical sizing; FMEA/hazard review; instrumentation readiness.	Design review record; updated test procedures.	Build / rework
C2 - Bench readiness	Assembly, dimensional inspection, no-load function, sensors, guards and emergency stop.	Build record; inspection log; bench release.	Test / hold
C3 - Performance	Torque/speed/efficiency, backlash/runout, thermal rise, current, noise and repeatability.	Raw data; plots; anomalies and corrective actions.	Integrate / iterate
C4 - Duty-cycle	Representative operating profile, overload boundaries, endurance sampling and post-test inspection.	Validation report; limitations; residual risks.	Close / extend

Readiness and pipeline

Entry position: TRL 2→3 (technology concept formulated; experimental proof-of-concept work beginning). The pilot is designed to produce evidence supporting TRL 3 and, only if subsystem validation in a relevant laboratory configuration is demonstrated, a reasoned path toward TRL 4. TRL advancement is an evidence conclusion, not a contractual guarantee.

Editable n-week pilot plan

The schedule begins on the agreed Kickoff Date. Filled cells indicate the planned activity window; dates and sequencing may be edited by mutual written change control. Below is a tentative chart, which must be rebuilt upon agreement of both sides.



Expected outputs by nth week

- Approved requirements and interface control record; traceable risk register and test matrix.
- Configured pilot article and bench/integration records, subject to availability and agreed bill of materials.
- Raw and processed test data; calibration references; anomaly and deviation log.
- Final validation report stating results, uncertainty/limitations, residual risks and recommended next engineering step.

Success criteria to be completed jointly at C0

METRIC	TARGET / TOLERANCE	METHOD	PROVISIONAL DEADLINE
[e.g., continuous output torque]	[value / tolerance]	[procedure / instrument]	
[thermal rise at duty cycle]	[value / ambient]	[procedure / duration]	
[backlash / repeatability]	[value / uncertainty]	[procedure]	
[integration / controls]	[pass condition]	[demonstration]	

Working model and governance

- Weekly 30-minute review; checkpoint approvals recorded by email or signed minutes of meeting (MOM).
- Safety-first stop-work authority for either side where personnel, property, compliance or equipment may be at risk.
- Controlled changes to scope, timing, acceptance criteria or cost require a traceable change note before implementation.
- Partner provides accurate use-case inputs, integration access, competent personnel and a safe test environment; Maiden provides reasonable engineering skill, records, pilot articles and reports as agreed.

Commercial framework (May/may not be applicable to all)

Pilot fee: [INR / USD _____ plus applicable taxes]. Payment milestones: [__% on signature; __% at C2; __% on final report]. Partner-specific travel, third-party certification, destructive testing, tooling and replacement articles are excluded unless expressly listed. A definitive Pilot Agreement will govern execution.

What a successful pilot means

Success means that both parties possess reliable evidence to decide the next step. Depending on results, that may be an iteration, a broader validation programme, a separate design partnership, manufacturing discussion or a disciplined stop. No outcome obliges either party to enter a future transaction.

Proposal status and next step

This proposal is non-binding and for discussion only, except that information already protected under a separate confidentiality agreement remains subject to that agreement. The pilot starts only after a Pilot Agreement and its completed schedule are signed by authorised representatives.