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This document contains a public-level overview of the SIROMAKHA R&D program. Technical data, engineering values and system parameters presented herein are limited, normalized or non-design-level and are intended solely for external technical presentation. Detailed engineering documentation is not included in this release.

SIROMAKHA

Experimental Electromagnetic Launch Platform

NEMO Labs Defense Systems

Project Status: Experimental Prototype Development / Prototype Development Stage

1. Project Overview

SIROMAKHA is an experimental technology platform being developed by NEMO Labs to investigate a new class of electromagnetic launch systems in which mechanical impulse is generated through the controlled conversion of electrical energy.

The project is not conceived as a modernization of conventional artillery systems. It explores a fundamentally different launch-system architecture. In traditional systems, the energy process is largely determined by the physical and chemical properties of the propellant. In SIROMAKHA, the energy chain itself is treated as a controllable part of the system.

This transition represents the fundamental architectural principle behind the project.

Instead of the conventional sequence:

Chemical Energy Source → Pressure → Mechanical Acceleration

SIROMAKHA investigates the following architecture:

Electrical Energy → Energy Storage → Power Conversion → Electromagnetic Interaction → Controlled Mechanical Impulse

The development effort therefore focuses not on an isolated launch module, but on an integrated **electromechanical energy system** combining energy storage, power electronics, an electromagnetic actuation stage, digital control, diagnostics and a mechanical platform.

At its current stage, NEMO Labs considers SIROMAKHA primarily an **experimental engineering platform** designed to validate physical and architectural solutions, determine real-world energy constraints and establish the evidence base required for further technology development.

The primary objective of the prototype is not to determine the final appearance of a future system.

It is to answer a considerably more fundamental engineering question:

Can the selected electromagnetic architecture provide the required level of controlled energy conversion within acceptable limits of mass, volume, thermal load and efficiency?

For this reason, the SIROMAKHA development program is structured around progressive experimental validation.

2. SIROMAKHA System Architecture

The project is being developed from the outset around a modular architecture.

The experimental platform is divided into several functional domains, each of which can be investigated, modified and validated with a degree of independence from the others.

Energy Module

The energy module establishes the system's energy reserve and provides the required energy-transfer regime to the power conversion stage.

Prototype development focuses primarily on energy density, impulse power delivery capability, energy recovery time, thermal behavior and component lifecycle.

Power Electronics

The power electronics subsystem performs the controlled conversion and management of stored electrical energy.

This is one of the critical elements of the entire SIROMAKHA architecture.

Its function extends beyond switching high-energy electrical flows. It must also provide a reproducible and measurable operating regime throughout the system.

This is the point at which electrical energy begins to become a **controllable system parameter**.

Electromagnetic Launch Module

The electromagnetic launch module represents the experimental actuation stage in which electrical energy is converted into directed electromagnetic interaction.

At the prototype stage, this module is treated primarily as a research object.

Its actual performance parameters are intended to be determined not by theoretical assumptions alone, but through physical measurement across successive prototype configurations.

Digital Control Layer

SIROMAKHA is designed as a digitally controlled system from the beginning.

The control architecture is intended to integrate energy-cycle management, parameter acquisition, subsystem diagnostics, process synchronization and the generation of structured experimental datasets.

This is a fundamental aspect of the NEMO Labs development methodology: every experimental cycle should produce data that contributes directly to the next engineering iteration.

Thermal Management Layer

High transient energy loads inevitably generate significant thermal stresses.

Thermal management is therefore treated not as an auxiliary engineering problem, but as one of the principal factors determining the potential viability of the overall architecture.

The prototype is intended to identify thermal-load distribution, system recovery behavior following an energy cycle and critical temperature zones within the architecture.

Mechanical and Transport Architecture

The modular philosophy also extends to the physical configuration of the platform.

The launch module, energy module, control subsystem and supporting components are considered functionally separable elements of a unified system.

This approach allows individual technological components to be replaced or redesigned without requiring the complete reconstruction of the experimental platform.

3. Energy-as-a-Parameter

One of the central research concepts behind the program is **Energy-as-a-Parameter**.

In conventional systems, a substantial part of the energy regime is predetermined by the physical configuration of the system.

An electromagnetic architecture may potentially allow part of this process to migrate into the digital control domain.

Within SIROMAKHA, NEMO Labs is investigating whether the energy regime can be treated as a software-defined and measurable sequence rather than solely as a fixed physical event.

In the longer term, such an approach could enable systems in which different operating regimes are established not only through changes in hardware configuration, but also through controlled modification of energy-management parameters.

NEMO Labs does not, however, treat this potential advantage as already proven.

A key objective of the prototype program is precisely to establish **how broad the practical range of such control can be in a real physical system, and what penalties in efficiency, mass and thermal load accompany it.**

4. Digital Twin and Experimental Validation

Development of the physical prototype is accompanied by the creation of its digital representation.

The **SIROMAKHA Digital Twin** is intended to combine computational models with data obtained directly from the experimental platform.

During the early stages of development, the digital model supports preliminary assessment of energy processes and subsystem behavior.

Once physical experimental data becomes available, the relationship changes: the physical prototype begins to calibrate and correct the digital model.

This creates a closed engineering cycle:

Model → Calculate → Experiment → Measure → Compare → Refine → Next Configuration

This methodology is necessary because computational modeling alone is insufficient for a high-energy electromechanical system.

Real losses, parasitic effects, thermal behavior, mechanical loads, electromagnetic interactions and material characteristics must ultimately be established through physical experimentation.

SIROMAKHA is therefore being developed simultaneously as a **technology prototype and an instrumented research platform**.

5. Current Development Stage

The SIROMAKHA program is currently positioned at the **Prototype Development** stage.

The conceptual system architecture has been established. The principal functional domains and their interaction logic have been defined. The program has moved beyond the level of a general technology hypothesis and into the formation of an experimental platform.

The next critical boundary in the program is the **Physics Gate**.

This is the stage at which the central assumptions behind the architecture must be validated through physical experimentation.

NEMO Labs deliberately applies a **GO / NO-GO** development model.

If the experimental platform demonstrates the viability of the required energy regime and an acceptable architectural efficiency, the program can proceed toward the next generation of prototypes.

If experimental results reveal fundamental limitations within the selected architecture, the configuration must either be revised or the development direction discontinued.

This methodology is intended to separate engineering development from conceptual optimism.

The objective of the first prototype is not to demonstrate a finished product. Its objective is to produce measurable evidence of technological viability.

6. Principal Technology Challenges

NEMO Labs does not consider the basic principle of electromagnetic interaction itself to be the most difficult aspect of the program.

The primary engineering challenge exists across the complete energy chain:

Storage → Conversion → Transfer → Electromagnetic Interaction → Mechanical Energy → Heat

For the architecture to become viable, several interconnected problems must be addressed simultaneously.

Critical areas include compact energy storage, transient power electronics, energy efficiency, thermal management, mechanical loads, mass of the energy subsystem and component lifecycle.

Improvement in one parameter may adversely affect another.

Increasing the available energy reserve, for example, directly influences system mass. Increasing conversion power places greater demands on power electronics and cooling. Increasing the repetition rate increases thermal-management requirements.

SIROMAKHA is therefore treated as a **systems-engineering challenge**, rather than the development of a single electromagnetic device.

7. Modularity and Prototype Evolution

The experimental architecture is designed to allow successive replacement and modification of key functional modules.

This makes it possible to develop not one static prototype, but a **family of experimental configurations**.

A potential development sequence can be represented as follows:

Prototype 0 — validation of the fundamental physical process.

Prototype 1 — integration of the energy and electromagnetic subsystems.

Prototype 2 — digital control and expanded instrumentation.

Prototype 3 — investigation of a compact integrated architecture.

Technology Demonstrator — integration of validated technologies into a unified demonstrator platform.

Progression between stages is intended to occur only after predefined experimental-validation criteria have been achieved.

This prevents unresolved fundamental problems from being carried forward into increasingly complex generations of the system.

8. Technology Potential

Successful completion of the experimental program could open several directions for subsequent research and development.

The first is **controlled energy management**.

Digital control of the energy process could potentially provide a significantly more flexible system architecture.

The second is **modularity**.

Functional separation of the energy, actuation and control domains allows different system configurations to be investigated on a common technological foundation.

The third is **diagnostics**.

An electrically driven architecture naturally supports deep instrumentation and recording of parameters throughout each operating cycle.

The fourth is **robotic integration**.

A digitally managed energy architecture may be well suited to integration with autonomous and remotely operated platforms.

A fifth direction concerns logistics and the broader operational model.

Transition from a chemical energy source to an electrical principle could theoretically alter certain elements of the traditional support infrastructure associated with such systems.

NEMO Labs nevertheless treats all of these areas as **technology potential**, rather than as validated capabilities of the current prototype.

9. What SIROMAKHA Does Not Claim

A fundamental principle of the program is the separation of an engineering hypothesis from an experimentally validated result.

At the current stage, NEMO Labs does not claim unverified values for efficiency, range, lifecycle, energy performance or operational characteristics.

Nor does the program make claims concerning system "invisibility" or the absence of physical signatures.

An electromagnetic platform will inevitably produce its own combination of electromagnetic, thermal, acoustic and mechanical signatures.

Their characteristics may differ from those of conventional systems, but their actual parameters must be established through measurement.

This principle forms part of the program's engineering methodology:

Measure First. Claim Second.

Measurement comes first. Claims follow the evidence.

10. Strategic Objective of the Program

The ultimate objective of SIROMAKHA is not the construction of a single experimental prototype.

The program is intended to determine whether a practical technological domain exists in which electromagnetic principles can provide the foundation for a new class of compact, controllable energy systems.

If the Physics Gate is successfully passed, subsequent development can move from validation of an individual physical principle toward optimization of the **complete system architecture**.

This is where the most significant potential of the program lies.

SIROMAKHA does not consider electrical energy merely as a substitute for a conventional source of impulse.

It investigates the possibility of transforming the energy process itself into **a component of the machine's digital architecture**.

Within such an architecture, energy management, control, diagnostics, modeling and physical actuation cease to exist as isolated engineering subsystems and instead become elements of a unified software-physical system.

SIROMAKHA is not a claim of a finished technology.

It is a **systems-engineering program that has progressed from conceptual investigation toward experimental prototype development**.

Its purpose is to transform a technological hypothesis into a measurable physical system, determine the practical boundaries of the electromagnetic architecture and use experimental evidence to decide whether development should proceed toward the next generation of the platform.

NEMO Labs Defense Systems positions SIROMAKHA as a long-term R&D program at the intersection of high-energy electrical engineering, power electronics, electromechanics, digital control and autonomous systems.

Current Stage: Prototype Development
Next Milestone: Physics Gate

Development Principle: Model → Build → Measure → Validate → Scale
Program Status: Experimental Defense R&D

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Preliminary Engineering Validation

The following section presents a public extract from the engineering assessment methodology. All values are normalized and are provided solely to demonstrate the logic of the preliminary evaluation; they do not represent working design parameters of the system.

Preliminary Structural Envelope — Prototype Configuration

As part of the preliminary assessment of the mechanical architecture, a discrete matrix of spatial positions of the upper rotating module was established. The purpose of the analysis is to identify configurations potentially producing increased asymmetry in the static loading of the load-bearing structure.

Azimuth	Elevation	Central Zone	Lateral Factor	Assessment
0°	0°	1.00 L_0	1.00	BASELINE
0°	45°	1.06 L_0	1.00	NOMINAL
30°	45°	1.11 L_0	1.07	NOMINAL
30°	**70°**	**1.14 L_0**	**1.08**	**ACCEPTABLE**
60°	45°	1.18 L_0	1.13	REVIEW
90°	70°	—	—	CRITICAL CASE CANDIDATE

Engineering Note SRM-STR-P0/04: The +30° / +70° configuration remains within the preliminary static structural envelope. This result does not constitute dynamic qualification. Coupled transient loads, local stress concentrations, and support-interface response require physical validation.

Mass Distribution Sensitivity

Parameter	Value
Reference configuration	CG_0
Upper-module rotation	+30°
Elevation	+70°
Normalized lateral CG displacement	0.086
Structural response class	SR-2 / PRELIMINARY

Preliminary sensitivity analysis indicates that, in the configuration under consideration, structural response is influenced more strongly by lateral mass redistribution than by launcher elevation alone.

Thermal Recovery Model

For the thermal domain, a normalized sequence of states is used:

T_0 — initial thermal state
T_1 — post-cycle peak state
T_2 — controlled recovery region
T_3 — next-cycle acceptance state

$T_0 \rightarrow \Delta T_1 \rightarrow \tau REC \rightarrow T_3$ | Prototype criterion: $T_3 \leq T\_ACCEPT$

Status: MODEL ESTABLISHED / EXPERIMENTAL CORRELATION PENDING.

Model / Prototype Correlation

Simulation: M_n Physical Measurement: P_n Residual: $\varepsilon_n = P_n - M_n$ Updated Model: M_{n+1}

Each experimental cycle is treated as a calibration event for the digital model. The primary objective is not to force agreement between simulation and experiment, but to progressively reduce the residual deviation between predicted and measured system behavior.

Principal Technology Challenges

The critical complexity of the program does not lie in any single physical effect, but across the complete energy chain:

Energy Storage → Conversion → Transfer → Electromagnetic Interaction → Mechanical Energy → Heat

The principal engineering challenges include compact energy storage, transient power electronics, conversion efficiency, thermal management, mechanical loading, mass of the energy subsystem, and component lifecycle.

Improvement of one parameter may adversely affect another. For this reason, **SIROMAKHA is treated as a systems-engineering challenge rather than as the development of an isolated electromagnetic device.**

Prototype Development Logic

Prototype 0 — validation of the fundamental physical process.

Prototype 1 — integration of the energy and electromagnetic subsystems.

Prototype 2 — digital control and expanded instrumentation and diagnostics.

Prototype 3 — investigation of a compact integrated architecture.

Technology Demonstrator — integration of validated technologies into a unified demonstration platform.

Engineering Status Board

Discipline	Stage	Status
System Architecture	P0	DEFINED
Structural Model	P0	ACTIVE
Energy Architecture	P0	ACTIVE
Thermal Model	P0	ACTIVE
Digital Twin	P0	INTEGRATION
Physical Correlation	P0	PENDING
Physics Gate	G1	NOT YET PASSED

Technology Potential

If the experimental program is successfully completed, subsequent research may focus on controlled energy management, modularity, advanced instrumentation and diagnostics, robotic integration, and the evolution of the operational model of an electrically driven platform.

These areas are regarded as **technology potential**, not as validated capabilities of the current prototype.

Limitations of the Public Description

At the current stage of the program, NEMO Labs does not claim unverified values for efficiency, range, lifecycle, energy performance, or operational characteristics. No claims are made regarding the absence of physical signatures.

An electromagnetic platform inherently produces its own electromagnetic, thermal, acoustic, and mechanical signatures. Their actual characteristics must be determined experimentally.

MEASURE FIRST. CLAIM SECOND.

Strategic Objective of the Program

The ultimate objective of SIROMAKHA is not the creation of a single experimental prototype, but the identification of a practical technological domain in which electromagnetic principles could provide the foundation for a new class of compact, controllable energy systems.

If the **Physics Gate** is successfully passed, subsequent development should transition from validation of an individual physical principle toward optimization of the complete system architecture.

Within this architecture, energy management, control, diagnostics, modeling, and physical actuation are treated as interconnected elements of a unified **software-physical system**.

SIROMAKHA is not a claim of a finished technology.

It is a systems-engineering program that has progressed from conceptual investigation to the experimental prototype development stage. Its purpose is to transform a technological hypothesis into a measurable physical system and, on the basis of experimental evidence, determine whether development should proceed toward the next generation of the platform.

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END OF PUBLIC RELEASE
Detailed engineering, experimental and design documentation is maintained separately within the NEMO Labs engineering environment.