

Interstellar Object Contact Mission (IOCM): A Framework for Active Artifact SETI

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Abstract

The Interstellar Object Contact Mission (IOCM) framework proposes to use the passage of interstellar objects through our Solar System as opportunities for active SETI. It suggests attaching a beacon or artifact to an outbound interstellar body, turning it into a natural carrier of our presence. The paper presents the rationale and conceptual basis for such an act, positioning IOCM as a strategic addition to active SETI approaches.

Keywords

interstellar object; active SETI; artifact SETI; technosignatures; astrobiology; planetary protection; Outer Space Treaty.

Introduction

This paper extends the operational logic outlined in the author's eight-point framework for evaluating potential artificial activity — or technosignatures — in interstellar objects [24]. The passage of an interstellar object through our Solar System is both an astronomical event and a philosophical provocation [1–4]. So far, our reactions to interstellar objects like 1I/ʻOumuamua, 2I/Borisov, and 3I/ATLAS have remained observational—limited to telescopic tracking, spectral analysis, and post-encounter orbital reconstructions [5–7, 20, 21].

This paper introduces the Interstellar Object Contact Mission (IOCM)—a framework that treats these encounters as opportunities for conscious participation rather than passive study. It builds upon earlier gestures of cosmic outreach such as the Pioneer plaque and the Voyager Golden Record [22, 23].

The Rationale and Framework

Interstellar objects arrive already bearing two properties we can harness—escape velocity and a trajectory beyond the Sun [1–4]. While such bodies could also serve as platforms for short-duration scientific experiments or environmental sampling, these applications fall outside the scope of this paper. Here, IOCM is considered chiefly as a vehicle for active, artifact-based SETI. The framework envisions three modes of utilization [5–7, 15–17]:

1. Scientific inquiry: sensors on a departing ISO
2. Symbolic expression: continuation of the artifact-SETI lineage
3. Interstellar continuity: participation in the material traffic between stars

IOCM calls for maintaining small, rapidly deployable space or Earth-based systems capable of interception, attachment, and release once a suitable target is confirmed [5, 20, 21].

IOCM thus represents a first-of-its-kind proposal that unites two branches of active SETI: the broadcast of a deliberate radio signal and the emplacement of the transmitter itself as a physical artifact. A civilization detecting such a signal would infer the presence of a device aboard a passing interstellar object—possibly accompanied by additional artifacts placed nearby, carrying further information or context.

Mission Architecture and Artifact Design

The operational logic of IOCM can be outlined in three phases, each addressing a distinct stage of engagement with a passing interstellar object.

Readiness: Maintain small interceptor units at stable waypoints such as L1 or L2, prepared to act when an interstellar trajectory is confirmed (the ESA–JAXA Comet Interceptor provides the closest operational model) [5].

Interception: Conduct a brief, high-velocity encounter—aiming for controlled contact rather than full rendezvous [5–7,20,21].

Attachment: Lessons from surface anchoring attempts, including Philae’s harpoons and subsequent penetrator studies, indicate that low-mass anchoring is feasible if tailored to fragile or rotating surfaces [10,11].

Artifact Typologies

IOCM envisions three kinds of payloads that could be deployed upon contact:

Instrumental tag: designed for short-duration scientific measurements during the outbound phase.

Passive artifact: durable, micro-etched media intended to be discovered only upon direct inspection, in the tradition of earlier human artifacts [18,19].

Active beacon: a low-duty narrowband or optical transmitter; technically feasible but constrained primarily by mass, power, and community caution rather than formal policy [8,9].

In some configurations, the beacon may be accompanied by one or more passive artifacts placed with or near it, providing supplementary context or information to any future finder.

Design Philosophy

Each payload should remain small, non-disruptive, and self-sterilized—built to outlast its makers while upholding ethical restraint under the principles of non-interference, transparency, and stewardship outlined in international space law and COSPAR policy [12–14].

Broader Implications

Over longer timescales, successive IOCM missions could create a dispersed archive carried by interstellar objects, quietly increasing the chance of our signals or artifacts being encountered by another civilization. This perspective also implies that interstellar objects passing through our Solar System merit SETI monitoring while within observational reach, as potential hosts of outbound transmissions—such as beacons or signaling devices installed by other civilizations.

Conclusion

The Interstellar Object Contact Mission (IOCM) establishes a framework for using naturally outbound interstellar objects for artifact-based SETI. It combines interception readiness, minimal attachment capability, and ethical payload design to enable deliberate communication beyond the Solar System. IOCM integrates scientific, symbolic, and communicative aims within existing mission architectures and underscores the need for SETI monitoring of future interstellar objects while within observational reach, as potential hosts of beacons or signaling devices installed by other civilizations.

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