A-Z Mandible

Complete Master Document v2.0

Full Technical + Conceptual + Build + Adaptive + OPSEC + UX

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Abstract

This is the complete master document for A-Z Mandible, integrating all conceptual whitepapers, technical architecture, prototype progress, build instructions, sensor optimization, bone conduction feedback, haptic patterns, adaptive learning (including speech impediments), high-OPSEC design, and user experience guidance for both mute/deaf and high-security users.

Contents

Chapter 1

Core Philosophy

Speech begins as mechanical intent in the jaw, teeth, and skull *before* it becomes airborne sound.

A-Z Mandible captures this early mechanical signal and exports it as clean, usable input while enforcing strict constraints by architecture:

- No airborne sound capture
- No hearing required
- No visible external hardware during use
- No wireless by default
- No cloud dependency
- No complex training
- Failure modes are benign

Chapter 2

USB Mandible (Foundational Concept)

USB Mandible is a dental-scale, jaw-coupled assistive speech interface designed to convert non-audible speech intent into usable communication.

It operates entirely without airborne sound, auditory feedback, or complex user interfaces. Housed in a mouth-insert form factor approximately the size of a breath mint to USB dongle, it connects directly via physical USB.

Key Constraints:

- No hearing required
- No audible speech required
- No hand dexterity required
- No learning curve
- No wireless dependency
- No surveillance capability

Chapter 3

Whisper Amp

Whisper Amp is a jaw-coupled vibration amplification system designed to capture and amplify human subvocal and whispered communication through mandibular mechanical vibration rather than airborne sound.

It reframes speech capture as a mechanical phenomenon rather than an acoustic one.

Chapter 4

A-Z Mandible (Generalized Vision)

A-Z Mandible generalizes the concept into a full jaw-coupled intent interface that translates the full range of human speech intent — from whispered phonation to silent subvocal articulation — into usable digital input.

It is designed primarily for deaf and non-verbal users but functions as a general human input primitive.

Chapter 5

Prototype Progress (Phases 1–3 Completed)

Phase 1 — Signal Proof (SPU v0.1) — COMPLETED (95% confidence)

- Proved jaw movement produces usable electrical signal using piezo + Arduino.

Phase 2 — Whisper Amp Lite (v0.2) — COMPLETED (90% confidence)

- Added op-amp amplification stage. Significantly cleaner and repeatable signals.

Phase 3 — Signal Classification (v0.3) — COMPLETED (80% confidence)

- Implemented basic YES/NO pattern detection using peak timing logic.
- Achieved 80% accuracy on simple patterns.

Core Proof Achieved: Jaw = signal source. Signal = structured. Patterns = classifiable.

Chapter 6

Bone Conduction Self-Hearing Feedback

Purpose: Allow the user to "hear" their own intent in real time through bone conduction. This is especially powerful for mute and deaf users, creating a natural closed-loop experience.
Implementation:

- Small bone conduction transducer (mastoid or jaw placement)
- Low-power audio amplifier
- Two modes: Raw vibration feedback or processed clean audio feedback

Chapter 7

Haptic Design Patterns

Pattern	Meaning
Single short pulse (100–150ms)	Confirmation / Success
Double short pulse	YES detected
Long single pulse	NO detected or waiting
Triple pulse	Important alert
Gentle slow pulsing	System ready
Strong continuous	Critical warning

Chapter 8

Adaptive Learning + Speech Impediments

The system learns the **specific user** rather than forcing a generic model.

It handles:

- Dysarthria
- Apraxia of speech
- Stuttering / fluency issues
- Muscle weakness and fatigue

Progression: Simple binary → Short phrases → Full natural sentences adapted to the user's unique patterns.

All learning is local-only and user-controlled.

Chapter 9

High-OPSEC Variant

Default State: Physical USB connection only. No radios powered.
Wireless: Only via explicit hardware switch.
Recording: Requires multi-step physical enablement + on-device encryption.
Key Rules:

- Default air-gapped
- Hardware kill switches
- Silent failure modes
- Clear security state indication
- Tamper-evident design

Chapter 10

User Experience Guidance

10.1 Mute and Deaf Users

- Extreme simplicity on first use
- Large visual feedback mandatory
- Bone conduction self-hearing strongly recommended
- Haptic patterns for confirmation
- Forgiving and responsive design

10.2 High-OPSEC / Military Users

- Physical connection by default
- Wireless requires hardware switch
- Fatigue and stress resistant
- Clear security mode indication
- Instant disable capability

Chapter 11

Conclusion

A-Z Mandible offers a new primary communication channel based on mechanical intent rather than sound.

It provides powerful, private, and adaptive communication for mute and deaf users while also offering a hardened high-OPSEC variant for sensitive environments.

The hardware remains simple and reliable. The experience grows more natural and powerful with use.

"Speech begins as vibration. Capturing it early changes what is possible."