📚 Head First Mission Control — Complete Journey Index

① Core Deliverables

[A] Research & Technical

1. **Research Paper** — DSP/SDR-based counter-drone or IQ format work (4–6 months target, weekly logs)
2. **Practical Skills** — Python (DSP, NumPy, Matplotlib, SDR libraries) + RTL-SDR handling & live IQ data work
3. **IQ Data Standards / PhD Topic** — Lightweight IQ format spec, validation rules, annexures

[B] Career & Profile

4. **GitHub Repository** — Organized, documented, weekly commits as proof-of-work
5. **LinkedIn Profile** — Skills, proof-of-skill posts, project highlights
6. **Resume** — Projects, research achievements, open-source contributions

② Skill Pillars

Pillar 1 — Python Foundations [A+B]

- Data types, control flow, functions
- NumPy basics: shapes, slicing, indexing
- Plotting with Matplotlib
- File I/O and struct handling for SDR data

Pillar 2 — DSP Core [A]

- Discrete-time signals, sampling, Nyquist
- FFT fundamentals (bins, Δf, leakage, windowing)
- Filters (FIR, IIR basics)
- Spectrograms & time-frequency trade-offs

Pillar 3 — SDR Hands-On [A]

- RTL-SDR setup & live capture
- IQ data visualization and processing
- Signal detection & frequency estimation

- Application tie-in (counter-drone / comms analysis)

Pillar 4 — Standards Development [A]

- IQ file structure specification
- Validation & metadata handling
- Routing and structure guidelines for SDR software

Pillar 5 — Public Proof of Work [B]

- Weekly GitHub commits with clear readmes
- LinkedIn technical posts (plots, findings)
- Resume updates after every milestone

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③ Milestone Phases

1. **Foundation Phase** (Weeks 1–4)
   - Python, NumPy shapes & slicing
   - Basic FFT experiments on synthetic data

2. **Application Phase** (Weeks 5–8)
   - RTL-SDR setup, live IQ captures
   - FFT on real signals, leakage control, filtering

3. **Research Phase** (Weeks 9–12)
   - Data analysis for paper
   - Begin drafting IQ format annexures

4. **Publication & Profile Phase** (Weeks 13–16)
   - Submit paper draft
   - Finalize GitHub repo & LinkedIn case studies
   - Update resume

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④ Tracking Rules

- **Bin Size Warning Protocol:** if chat ≈ 150 messages or heavy data/code, alert:

  > "⚠ Mission Control: N too large, Δf slowing — start fresh buffer."

- **Tag Every Task:** `[A]` , `[B]` , `[A+B]`
- **Proof Requirement:** every week must show **evidence** — code, plot, doc, or capture — committed to GitHub

6️⃣ Weekly Checklist

- ☐ One technical skill advanced
- ☐ One deliverable progressed
- ☐ One proof pushed to GitHub
- ☐ One public-facing update (LinkedIn/GitHub)
- ☐ Mission Control review of pacing