

Excellent. Now we do this **for real**, exactly how it would be done on an **avionics Mission Computer (MC)** program.

What follows is **Phase-1 fully applied**, not theory.

This is what a senior expects you to *produce*, even if they never say it.

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## ● PHASE-1 APPLIED TO AN AVIONICS MISSION COMPUTER

(*System Decomposition & Requirement Ownership*)

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### 1 Phase-1 Starting Point (Inputs)

From **Phase-0**, we already have:

- ✓ System purpose understood
- ✓ Failure consequences known
- ✓ System boundaries defined
- ✓ Criticality understood (Mission-critical / Safety-critical)

Now we move from “**WHY**” → “**WHAT MUST BE GUARANTEED**”

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### 2 Functional Decomposition of the Mission Computer

- ◆ Rule enforced
  - No CPUs
  - No cards
  - No buses
  - No software names

Only **functions**.

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#### 2.1 Top-Level Functions (Mission Computer)

ID	Function
F-01	Acquire avionics data
F-02	Validate incoming data
F-03	Process mission algorithms
F-04	Fuse multi-source data

ID	Function
F-05	Distribute mission data
F-06	Manage operational modes
F-07	Monitor system health
F-08	Detect and isolate faults
F-09	Report status and BIT
F-10	Handle reset and recovery

👉 If a fresher misses F-06, F-07, F-08, F-10, they fail Phase-1.

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### 3 Convert Functions → Functional Requirements

Now we turn functions into contractual “shall” statements.

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#### 3.1 Core Functional Requirements

Examples (not exhaustive):

- FR-01:  
*The Mission Computer shall acquire data from connected avionics subsystems.*
  - FR-02:  
*The Mission Computer shall validate all incoming data for integrity and correctness.*
  - FR-03:  
*The Mission Computer shall process mission data within specified real-time constraints.*
  - FR-04:  
*The Mission Computer shall fuse data from multiple sources to produce consolidated outputs.*
  - FR-05:  
*The Mission Computer shall distribute processed mission data to dependent subsystems.*
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#### 3.2 Health & Safety Requirements (Where Professionals Stand Out)

- FR-06:  
*The Mission Computer shall continuously monitor internal health parameters.*
- FR-07:  
*The Mission Computer shall detect, isolate, and report faults.*
- FR-08:  
*The Mission Computer shall support degraded modes of operation.*

- FR-09:

*The Mission Computer shall support controlled reset and recovery mechanisms.*

⚠ Freshers focus on FR-01 to FR-05.

⚠ Seniors watch FR-06 to FR-09.

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## 4 Functional Flow Diagram (Mission Computer)

This is **mandatory**.

Avionics Inputs

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Data Acquisition

↓

Data Validation

↓

Mission Processing

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Data Fusion

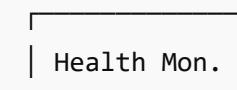
↓

Data Distribution

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Avionics Outputs

Parallel flows (often missed):



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Fault Detection

↓

BIT / Status

👉 If the junior cannot draw this **without the spec open**, they do not understand the system.

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## 5 Responsibility Allocation (Critical Phase-1 Skill)

Now we answer:

"Who is responsible for guaranteeing each function?"

## 5.1 Allocation Table

Function	System	Hardware	Software
Data acquisition	✓	✓	✓
Data validation	✓		✓
Mission processing	✓		✓
Data fusion	✓		✓
Data distribution	✓	✓	✓
Mode management	✓		✓
Health monitoring	✓	✓	✓
Fault detection	✓	✓	✓
BIT reporting	✓		✓
Reset & recovery	✓	✓	✓

⚠️ Key Lesson:

System responsibility NEVER disappears.

It only flows downward.

## 6 Identify Derived Requirements (Where Seniors Judge You)

These are **not written explicitly**, but are unavoidable.

### 6.1 Derived Requirements Examples

Primary Requirement	Derived Requirement
Real-time processing	Deterministic scheduling
High availability	Watchdog timers
Fault tolerance	Redundant paths
Data integrity	ECC memory

Primary Requirement	Derived Requirement
Continuous operation	Thermal monitoring
Reset control	Safe-state definition

If a fresher cannot identify these → they **don't think like an avionics engineer yet.**

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## 7 Requirement Classification (Professional Structuring)

Each requirement is classified:

Requirement	Type
FR-01	Functional
FR-03	Performance
FR-04	Functional
FR-06	Safety
FR-07	Safety
FR-08	Availability
FR-09	Recovery / Maintenance

This classification later drives:

- Architecture
  - Verification
  - Certification effort
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## 8 Ambiguity & Gap Analysis (Mandatory Output)

You **must raise issues.**

**Examples for Mission Computer:**

- Latency limits not defined for degraded mode
- Fault isolation time not specified
- Behavior during partial power loss unclear
- Reset allowed during mission phase unclear
- BIT reporting frequency not specified

⚠ Silence here = immaturity.

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## 9 Phase-1 Evaluation Checks (Used by Seniors)

They may ask:

### 🔍 Check 1

"Which function is most safety-critical?"

Expected:

- 👉 Fault detection / wrong data prevention
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### 🔍 Check 2

"Which requirement drives hardware selection?"

Expected:

- 👉 Real-time + availability + fault tolerance
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### 🔍 Check 3

"What happens if data validation fails?"

Expected:

- 👉 Data rejection + degraded mode + reporting
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### 🔍 Check 4

"Which requirement is hardest to test?"

Expected:

- 👉 Fault handling under real-time constraints
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## 10 Phase-1 OUTPUTS (Non-Negotiable)

For the Mission Computer, Phase-1 must produce:

1. Functional decomposition list
2. Functional flow diagram
3. Functional requirements list
4. Responsibility allocation table
5. Derived requirements list

## 6. Ambiguity / gap list

No outputs → Phase-1 **not complete**.

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### 1 1 Phase-1 COMPLETION CHECK (Mission Computer)

You are Phase-1 complete if you can answer:

“Which Mission Computer function, if it silently degrades, is the most dangerous — and why?”

If you say “*wrong data without fault indication*” →  pass.

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## What Comes Next (Phase-2)

### 👉 Phase-2: Architecture Definition for Mission Computer

This is where:

- Single vs dual MC
- PPC vs ARM
- VPX / backplane choice
- Redundancy philosophy
- Partitioning HW vs SW

If you want, I can:

- Proceed directly to Phase-2 (Mission Computer)
- Create Phase-1 evaluation tasks for freshers
- Simulate a real system design review
- Turn this into a training playbook PDF

Just say the word.