

Human Performance & Limitations - Module H — The Mind Aloft

Information Processing

Chapter 19 — How the pilot's mind takes in the world and acts on it: what aviation psychology is, why human error is inevitable, mental workload, and the information-processing model from sensory input to response.

BOOK

Human Performance & Limitations

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EXAM

DGCA CPL / ATPL — HPL

CHAPTER

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Plate 19.0 — The mind aloft. Every switch, call and decision passes first through the narrow channel of human attention.

1. Introduction to Aviation Psychology

WHAT THIS SECTION COVERS

Definition of aviation psychology, its aims, and how its tools support flight safety and efficiency.

Aviation Psychology is a specialty in applied psychology that focuses on understanding human behaviour, emotions and mental states as they relate to the operation and control of aviation systems and their influence on the safety and efficiency of flight.

The *aim* of aviation psychology is to understand and to predict the behaviour of individuals in an aviation environment. Its study is aimed at improving **safety, efficiency and comfort**.

Practitioners of aviation psychology bring the tools and techniques of psychology to bear in order to **describe, predict, understand and influence** the aviation community to achieve those aims.

EXAM TIP — THE FOUR ACTION VERBS

Remember the four practitioner verbs: **D – P – U – I** → *Describe, Predict, Understand, Influence*.

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2. Human Error & Human Reliability

WHAT THIS SECTION COVERS

The inevitability of human error and the four areas where pilot errors usually originate.

It has long been accepted that **human errors are inevitable**. The majority of pilot-related errors are considered to be failures of:

- Interpersonal skills
- Communications
- Decision-making
- Leadership

This does **not** mean that the frequency of error cannot be reduced, or that the effects cannot be avoided or mitigated.

GOLDEN MAXIM — "SUPERIOR PILOT"

"A superior pilot uses his superior judgment to avoid situations that would require his superior skills."



Figure 19.1 — The origins of pilot error: interpersonal skills, communication, decision-making and leadership, all trapped by good judgment.

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3. Workload

WHAT THIS SECTION COVERS

Cognitive (mental) workload definition, the four task factors that drive it, indirect factors and observable symptoms.

Workload = the amount of mental effort needed (and expended) to process information. Here we discuss **cognitive (mental)** workload, as opposed to physical workload. Workload is linked to almost all other areas within cognition and performance, particularly *attention, vigilance, fatigue, decision-making and multi-tasking*.

EFFECTS OF HIGH WORKLOAD

High workload is associated with **increased errors, fatigue, task degradation and poor performance**.

3.1 Four General Task Factors Affecting Workload

1. 'Difficulty' of the task
2. Number of tasks running in parallel (concurrently)
3. Number of tasks in series (switching from task to task)
4. The time available for the task (speed of task)

Indirect factors also play a role: *duration of task, fatigue and level of arousal*.

3.2 Symptoms of Increasing Workload

- Attention and task focusing
- Task shedding and re-prioritization
- Implications for Situation Awareness
- Increased use of decision short-cuts and less scrutiny or review
- Increased fatigue and chance of error

The area that deals with all such activity is called the **working memory** ('Information Processing').

EXAM TIP — WORKLOAD DRIVERS

Mnemonic "**DPST**" — *Difficulty, Parallel tasks, Series switching, Time available*.

4. Information Processing — A Functional Model

WHAT THIS SECTION COVERS

How sensory inputs are converted into reasoned actions through five mental stages, and the central role of working memory.

We receive information from the world around us through our senses: **sight, hearing, touch, smell and taste**. The "Gestalt laws" formulate basic principles governing how objects are mentally organised and perceived.

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4.1 The Five Stages of Reasoning

1. **Detection**
2. **Perception**
3. **Decision Making**
4. **Action** (responses are selected and executed)
5. **Feedback**

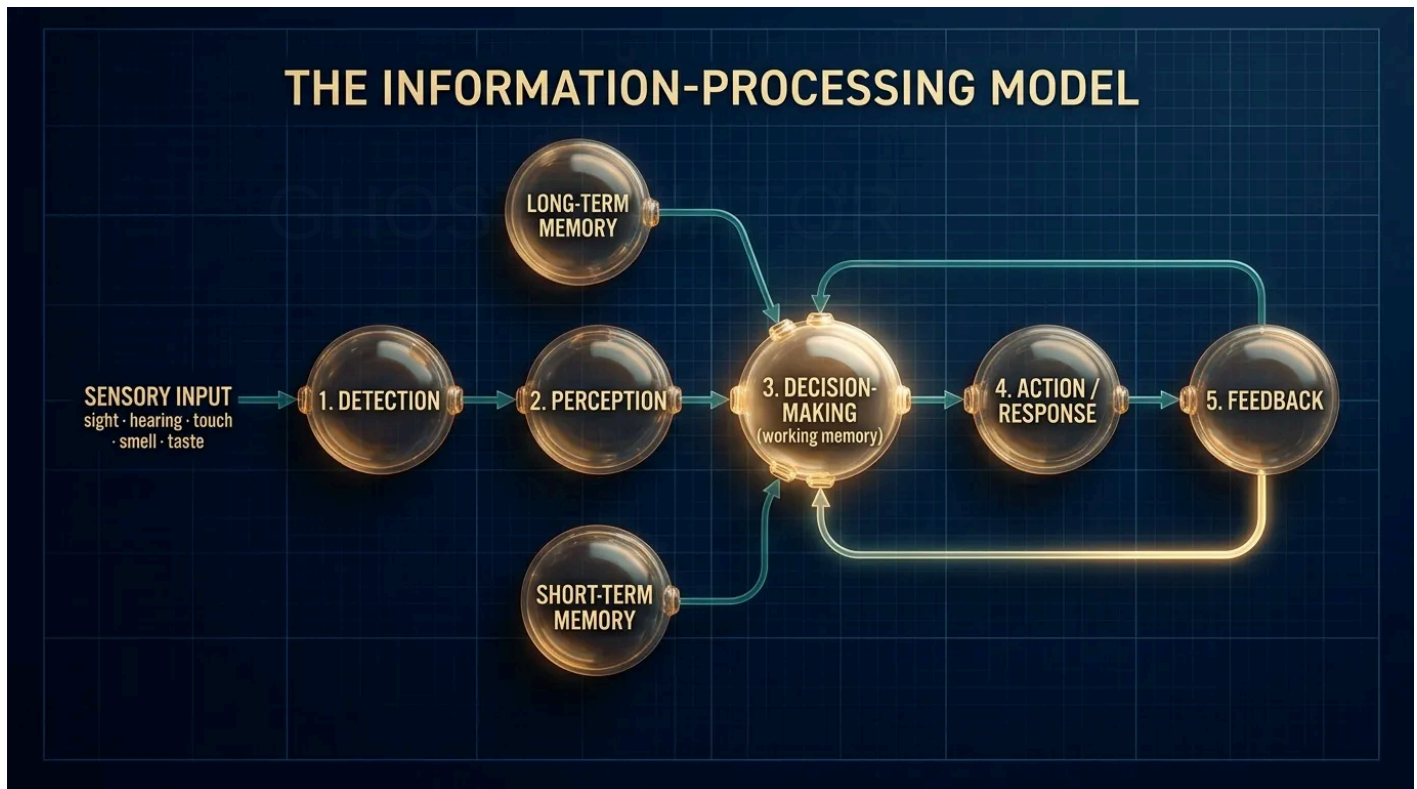


Figure 19.2 — The information-processing model: sensory input → detection → perception → decision → response, with feedback.

4.2 The Brain — Central Decision Maker & Response Selection

Once information has been perceived a decision must be made as to the response. Information is continuously entered into and withdrawn from both long-term and short-term memories to assist the decision process. The decision involves **input, processing, actions and feedback**. The information comes from many sources and requires *conscious processing* in working memory. A problem at any stage of information processing could affect the outcome.

To carry out multi-tasks we must learn skills through **Motor Programmes**.

4.3 Stimuli

The senses provide stimuli to our brain which has the ability to retain them for a short time, from the time they arrive. We may not have the processing capacity to deal with them all.

EXAM TIP — FIRST STAGE

First stage in the information process = **Sensory stimulation** (not "Attention", not "Perception"). Detection is what follows.

✦ END OF CHAPTER 19 ✦

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