# Technical description of SHELL Model.

**General Description:**

The SHELL model is a conceptual model of human factors that clarifies the scope of aviation human factors and assists in understanding the human factor relationships between aviation system resources/environment (the flying subsystem) and the human component in the aviation system (the human subsystem). The SHELL model adopts a systems perspective that suggests the human is rarely, if ever, the sole cause of an accident. The systems perspective considers a variety of contextual and task-related factors that interact with the human operator within the aviation system to affect operator performance. As a result, the SHELL model considers both active and latent failures in the aviation system. Each component of the SHELL model (software, hardware, environment, liveware) represents a building block of human factors studies within aviation (International Civil Aviation Organization, 1993). The human element or worker of interest is at the center or hub of the SHELL model that represents the modern air transportation system.

**Purpose:**

It is recommended to:

Disseminate the findings of the present study to airlines, air service providers, regulators, pilot and controller organizations (unions). Conduct a comprehensive literature study on air-ground communication errors. Study communications occurrences related to data link problems. Analyze the use of similar call signs based e.g. timetable data, in order to identify those specific call signs used by airlines that cause confusion. Prepare information packages on risks and (new) mitigating measures for pilots and controllers regarding air-ground communication. Relate ICAO DOC 4444 r/t SARPS to occurrences, to check whether the currently prescribed mitigating measures in the r/t system are still adequately covering all hazards. Investigate radio communication between ground controllers and taxiing aircraft in greater detail (e.g. use of non-standard r/t because controller often has to explain in plain language what a/c should do, aircraft not all painted in company colors anymore, new means of pointing out a/c to other pilots necessary, tower designators are sometimes difficult to follow, many conditional instructions, etc.).