Introduction to the scope of the 2011 CAETS Convocation Program

Engineering Analysis and Management to Reduce Risks

In the context of this CAETS Convocation, we will define ***Risk*** as an event that if it occurs, it will have a negative (or sometimes positive) and substantial impact on the environment and its inhabitants.

Risks are normally addressed in two dimensions:

- Probability of occurrence
- Impact if and when it occurs

To reduce or mitigate a risk, both dimensions must be managed. Ideally, reducing the probability of occurrence is the most effective deterrence. Even tough there are very few options to do so for natural phenomena, there are many more for man made installations that may be a risk.

In all cases, impact can be reduced, by different means:

- Designed-in elements that direct, deflect, slow down, resist, contain, the matters that cause damage.
- Early preparation to reduce losses and speed recovery.

A third dimension is post-occurrence and is directed to salvage, damage control and recovery.

In all of these dimensions of risk, engineering is a key player.

CAETS members are invited to participate and propose actions to reduce risks, considering four areas of concern:

a) Hydrological related risks, mostly flooding.

b) Seismic related risks.

c) Man caused risks, focused on oil and gas.

d) The new set of skills that engineering must develop to appropriately meet the challenges presented by the ongoing climate change.

The first two areas of concern deal with nature initiated phenomena. However, man's actions can increase or reduce the associated risk, as for example in the location of population centers, or the way river crossing installations affect its behavior during extreme conditions.

The third area of concern may deal with the difference of risk assessment during design for an oil installation as compared, for example, with a nuclear installation. Recent events show that impact of oil spills and gas leaks can cause severe damage to the environment and population, while design standards are far from the restrictions of a nuclear facility.

Finally, climate is changing. Regardless of its causes −still an ongoing debate− and the means to reduce it, there is change and it has an enormous inertia.

How should engineers deal with that? How will it affect the knowledge base of engineering? How should new engineers be educated? What new engineering disciplines may be needed?

Contributions may focus on one or more of several areas of knowledge regarding the reduction of risk, in the context stated above, such as:

- Identification and assessment of risk
- Operational experience and feedback, especially in those technologies which are least tolerant of failures
- Engineering analysis (experimental, simulation and modeling)
- Asset health monitoring and management, in the context of risk minimization
- Policy and regulation
- International collaboration in search of robust solutions for risk management and minimization
- Changes in engineering education
- New or emerging engineering disciplines