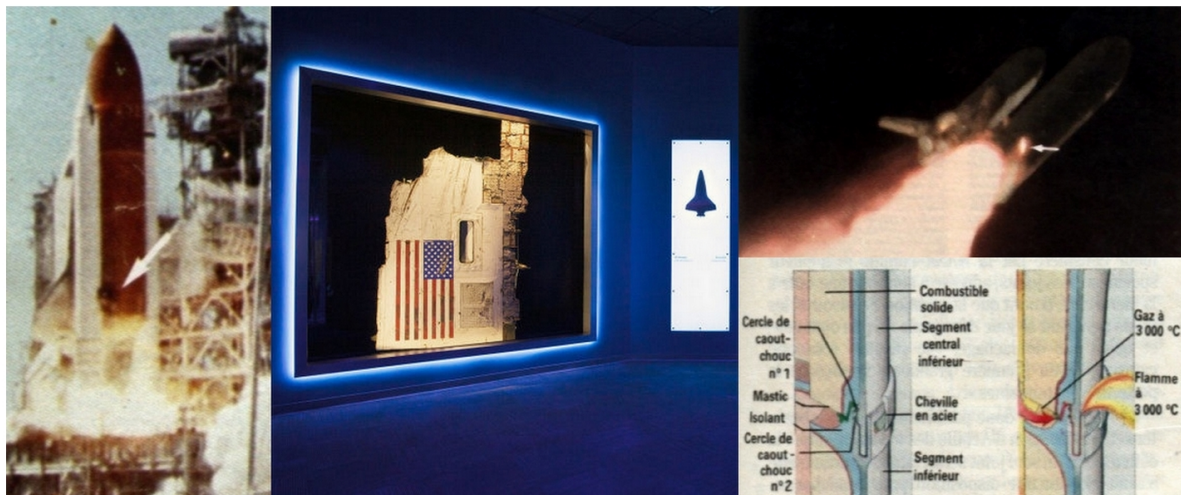




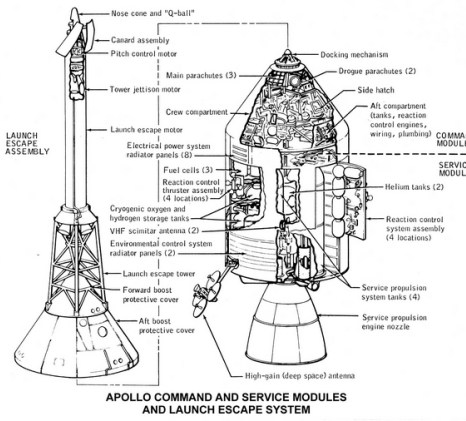
28th January 1986, by one morning icy, the shuttle Challenger on the way for mission STS-51L is ready with its launching of Cap Canaveral in Florida. With on its board a mixed crew of astronauts and with competences hétérocytes. Five mens and two womens (photo opposite) of which Christa McAuliffe, american teacher, who was selected like first astronaut resulting from the civil society. Its objective was to give a course to its pupils remained on Earth. After many carryforwards due to freezing since the morning of lacing by cause of bad weather, the Space Centre Kennedy gives his green light. At 11:38AM, the most complex machine built by the Man springs in a noise deafening under the glances of thousands of spectators as well as million of televiewers. 73 seconds later, Challenger exploded under the eyes of all. This atrocious drama nailed 32 months the space shuttles on the ground. Later, the investigation shows that one of the joints of one of the booster rockets with powder was not reliable in the event of freezing. At the time of takeoff, the internal pressure fed a breach and a flame coming to make an effect of blowtorch on the principal tank. Another detail of the investigation shows that the systems of survival were engaged for three of the seven astronauts. Starting only manually, the conclusion was radical. Three astronauts still lived at the time of the explosion and the impact on the ocean. The cockpit as well as the remains touched water surface with a force of 200 G. No loophole in this kind of situation. Then, where are progress concerning the security of the crews during a critical phase of takeoff ?



STS-51-L crew (front row) Michael J. Smith, Dick Scobee, Ronald McNair (back row) Ellison Onizuka, Christa McAuliffe, Gregory Jarvis, Judith Resnik.



Since the Fifties, at the moment of the first manned space flights, when the ballistic missiles were modified in rocket for the space conquest. The concern of the security of the astronauts was already a paramount element and the engineers had like idea to apply what is done best at the time in aeronautics. Thus them first capsules Gemini (the USA) and Vostok (the USSR) were equipped with ejector seats. This technique remained dangerous until the arrival of the rockets of second generation a few years later. With Mercury (USA) and the Soyuz (USSR) that a new more effective system comes out, known under the name of escape system (pictures below). This tower of cylindrical rescue is hoisted at the top of the rocket and guarantees a better security of the crew by leaving it inside the cockpit but also while moving away it moreover from rocket, via rockets carrying. This process showed its mettle to date and remains still largely used, also by the news private space companies like SpaceX / Blue Origin for their future projects of inhabited launching.



Escape system - Mercury/SaturnV

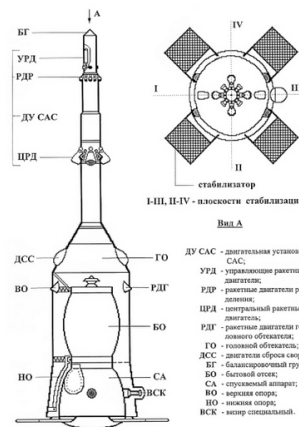
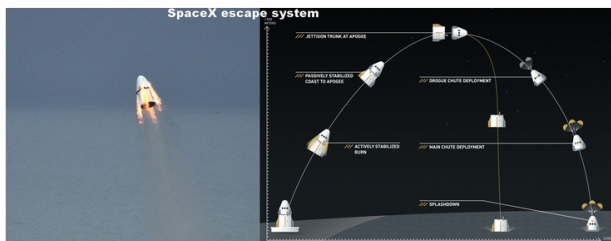


Fig. 1. CAC System Diagram.

Escape system - Soyouz



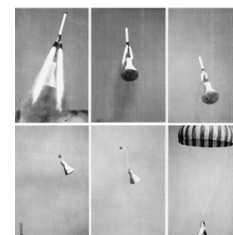
Escape system - SpaceX



Escape system - Blue Origin



Classic ejector seat



Mercury escape system test

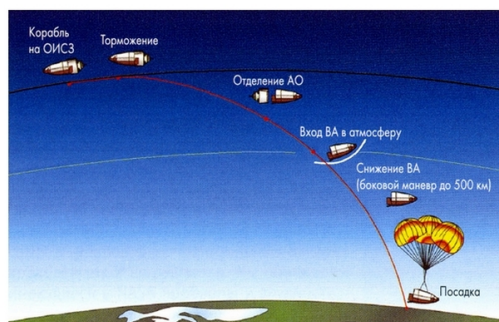
While plunging us a little towards the future, we can say ourselves according to the sketches which the security of the astronauts will be a field at which the engineers but also the limits of the human body will be put at severely tested. In wanting to save lives at increasingly high altitudes and speeds and mortals, we will confront ourselves with the extremes of what a body can resist without any damage. Many challenges are to be raised but the stages are carried out. October 14th, 2012, Felix Baumgartner (photo opposite and below) proved, while jumping of a stratospheric balloon with 24 miles that a physical fine shape person could pass the wall of the sound in freefall (wall of the sound = 767 mph). The actors of aerospace overflow of ideas in order to guarantee to the maximum the integrity astronauts. In the next years, we will see combinations of atmospheric re-entry being able to box 3632 °F and pointing out a certain hero of game-video Microsoft Games or various accessories of survival (images below).



Felix Baumgartner during the stratospheric jump (24 miles).



Combination of reentry



Protocol of Buran re-entry



Project of space shuttle ESA in re-entry



In conclusion, for about sixty years, the technology and the security of the astronauts have evolved in a radical way. The rockets have for most time a system of rescue which ejects the capsule and its crew. The space shuttles haven't an equal system what leaves any exit in event of problem during launching. Takeoffs and re-entry are the most delicate phases. The percentage of mortality in spaceship is very weak for the number of launching but risk zero does not exist and space remains the most hostile place with the Man. The accident research has helped to understand various dramatics events so that they don't reproduce again. The human factor by bad decisions or a technical failure can always involve a catastrophe. For the S.S. Challenger, a precipitation of decision and engineering problems with at the beginning a hole of some centimetre on a joint of one of the two booster rockets. Let us not lose with the spirit which we are yet only at the beginning of our tour in the space exploration and which many obstacles are to be come.

Guillaume Mahé