

Ice & Fire: The Outer Planets Program

Robert L. **Stahle**, John B. Carraway, **Karla B. Clark**,
James E. Randolph, **Richard J. Terrile**

Jet Propulsion Laboratory, California Institute of Technology

Less than two solar diameters from the surface of the **Sun...more** natural radiation around Jupiter than would be encountered immediately following a nuclear **war...to** the farthest planet and beyond; . . .these challenges are faced by the three “**Ice & Fire**” missions: Solar Probe, Europa Orbiter, and **Pluto-Kuiper** Express. Technology developments now in progress make these missions achievable at costs recently thought adequate only for missions of relatively short durations to “nearby” destinations.

Europa Orbiter, designed based on Galileo results still coming in, will determine whether a **global** subsurface liquid water ocean is present, and will identify locations where the ocean, if it exists, maybe most accessible to future missions. **Pluto-Kuiper** Express will complete the reconnaissance of the known planets in our Solar System. A mission extension to an “Ice Dwarf” in the newly-discovered **Kuiper** Disk may be possible. Solar Probe will deeply penetrate our nearest star’s atmosphere **to** measure the birth of solar wind, and to image the photosphere at high resolution.

Avionics technology will enable **lower** costs, power and mass, and the ability to package with modest shielding to survive at Europa inside Jupiter’s intense radiation belts. The same avionics and the software can be used on the other two missions. Each mission has a long cruise to its destination, during which the **spacecraft** will be relatively autonomous to save cost. They will **self-**monitor and self-command, while sending a continuous beacon alerting inexpensive ground receivers to general spacecraft health and any need for immediate attention.

The three missions are to begin the Outer Planets/Solar Probe exploration program first proposed in the 1998 Federal Budget, with a first **launch** expected **early** next decade.