ARIES Integrated IFE Chamber Analysis and Assessment Research
Discussion Draft for 5/17/00 Conference Call

Scope of Activity:

The goal of the integrated IFE chamber analysis and assessment research performed by the ARIES Team is to:

1) Analyze and asses integrated and self-consistent IFE chamber concepts;
2) Identify the design/operation window for each promising concept;
3) Identify present data base and need extrapolations for each promising concept;
4) Identify high-leverage items for R&D.

It is very important to note that the research is **not** aimed at developing a point design. While a "strawman" design point may be necessary to provide a framework for analysis, the focus is on understanding the trade-offs among various systems and identifying promising concepts. As an example, for a gas-protected dry-wall chamber, we would like to resolve the following type of questions:

1) What is the range of gas pressure (and type of gas) to protect the wall?
2) What are the loadings on the wall as a function of gas pressure, chamber temperature, wall distance, etc?
3) What are possibilities for target injection and tracking as a function of gas pressure, wall temperature, wall distance, target design and manufacturing?
4) What is the first-wall thermal hydraulic and mechanical design window as a function of loading?
5) What is the impact on the final optics?
6) What is the impact on driver propagation and focusing in the chamber?
7) Would change in target design make a difference?

An important contribution of our activity is to help guide R&D. In this area we need to identify for each promising concept:

1) What data is missing?
2) What analysis tool is missing? What are shortcomings of present tools if any?
3) For incomplete database, what is being assumed and why?
4) For incomplete database, what is the acceptable range of data? Would it make a difference to zeroth order, i.e., does it make or break the concept?

Approach:

A variety of IFE chamber concepts have been proposed. These together with number of drivers and possible target designs make a large number of possibilities. In order to make progress, I suggest:

1) We choose a minimum of two and a maximum of four target designs for analysis. For a start, we choose designs that are already produced in detail.
2) We divide our activities based on three classes of chambers:
    a. Dry wall chambers;

b. Solid wall chambers protected with a “sacrificial zone” (such liquid films);
c. Thick liquid walls.

We will analyze these classes of chambers in series.

We can then follow an iterative process such as shown below to perform a self-consistent and integrated analysis.

Team Interaction:

It is essential that we work as a team. We will make decisions by consensus and technical arguments carry the day. Only this way, we can reach conclusions that include the whole wisdom and experience of the community and are supported by the community as a whole. This is a scientific enterprise and credibility is the key. We are the ones that should say what data is missing and what are the shortcomings of data and/or our analysis rather than reviewers.

Historically, ARIES Team has operated in this mode. Both Les Waganer and I try to ensure that task leader communicate with each other, a credible research is performed and tasks are accomplished on time. Technical task leaders lead the technical activities. I expect that each task leader to be one of the contributors, if not the biggest, to his/her task

Technical Task Breakdown:

Below is our initial technical task breakdown that I have put together based on discussion with key people in each institution. To ensure communication, I have tried to have at least two institution involved in each area to bring in different points of view. In some areas, tentative task leaders are identified.

Target Physics:	NRL, LLNL
Chambers (overall leader: Tillack):	
Physics (Peterson?):	UW, UCSD
Engineering (Raffray)	UCSD, UW
Neutronics (El-Gubaley)	UW
Material (Billone)	ANL (Contact with material community)
Safety (Petti)	INEEL, UW, LLNL
Tritium (Sze)	ANL
Chamber Clearing (Tillack)	UCSD, UW
Target Fabrication, inject, & tracking (Gooding)	GA
Systems: (Miller)	UCSD, LLNL, Boeing
Driver:	
Driver/chamber interface:	UCSD, LLNL
Driver design	NRL, LLNL, LLBL

An Integrated Assessment Defines the R&D Needs