phase under pressure was believed to be reversible and is undoubtedly controlled by reaction kinetics.

1.4 The Pu 1.0 wt.-% Ga alloy, therefore, even when completely homogenized, will be metastable with respect to the application of pressure. Because of the 0.1 to 1.5 wt.-% Ga gradient resulting from coring, the degree of pressure metastability or alpha forming tendency will be greater. A test for proximity to an equilibrium or homogenized condition would then be the determination of density before and after the application of pressure. The greater the density increase because of alpha formation, the farther the alloy is from the equilibrium state. As the equilibrium or homogenized condition is approached, the density change should decrease and level off at a constant value.

1.5 A third feature concerns the tendency to form intermetallic compounds during preparation of the alloy. For alloy compositions up to 3.0 wt.-% Ga the formation of $Pu_xGa_y$ compounds reduces the gallium available for delta stabilization. Thus, while the total gallium content is as specified the amount of gallium available for stabilization may be substantially lower. To prepare successfully the alloy using induction or resistance heating facilities, it is felt that melt temperatures in the range of 1100 - 1300°C must be achieved. Because of the inherently high metal temperatures achieved during arc melting, this method of alloy preparation prevents the formation of $Pu_xGa_y$ compounds.

1.6 In most of the compositional studies performed by other investigators, neither of the above-mentioned methods was used to prepare the alloy. Therefore it was decided to redetermine the compositional effects on several properties using properly prepared alloys. In addition, it was decided to study the phenomenon of pressure metastability in both cored and homogenized alloys.

## 2 Experimental Procedure

### 2.1 Experimental Material

2.1.1 The plutonium-gallium alloys used in this work were