## TABLE OF CONTENTS

INTRODUCTION			
EQUIPMENT AND EXPERIMENTAL PROCEDURE			
Extrusion Tooling			
Materials3Lubricants, Coatings, and Fluids4			
CHARACTERISTICS OF PRESSURE-DISPLACEMENT CURVES			
COLD HYDROSTATIC EXTRUSION OF 7075-0 ALUMINUM ALLOY			
ROUNDS AND T-SECTIONS			
Lubricants and Fluids6Billet Nose Design9			
$Tandem Extrusion \qquad . \qquad $			
Other Trials			
COLD HYDROSTATIC EXTRUSION OF AISI 4340 STEEL ROUNDS			
COLD HYDROSTATIC EXTRUSION OF Ti-6AI-4V TITANIUM ALLOY			
<b>ROUNDS AND TUBING</b>			
COLD HYDROSTATIC EXTRUSION OF WROUGHT TZM MOLYBDENUM			
ALLOY AND BERYLLIUM ROUNDS			
Die Design			
Stress-Relieved TZM			
Extrusion of Recrystallized TZM and Beryllium			
HYDROSTATIC EXTRUSION AND DRAWING OF BERYLLIUM WIRE			
REFERENCES			

## LIST OF TABLES

		rage
Table 1.	Billet Lubricants Used for Hydrostatic Extrusion During This Interim Report Period	4
Table 2.	Experimental Data for the Cold Hydrostatic Extrusion of 7075-0 Aluminum Alloy Rounds	7
Table 3.	Experimental Data for the Cold Hydrostatic Extrusion of Ti-6Al-4V Titanium Alloy Rounds and Tubing	15
Table 4.	Experimental Data for the Cold Hydrostatic Extrusion of AISI 4340 Steel	15
Table 5.	Experimental Data for the Cold Hydrostatic Extrusion of Wrought TZM Molybdenum Alloy and Beryllium Rounds	17
	LIST OF FIGURES	
Figure 1.	Die Seal Arrangements Evaluated in Hydrostatic Extrusion	3
Figure 2.	Classification of Pressure Versus Displacement Curves in Hydrostatic Extrusion	25
Figure 3.	Effect of Fluid and Billet Lubricant on Pressure-Displacement Curves Obtained in the Hydrostatic Extrusion of 7075-0 Aluminum at a Ratio of 20:1	8
Figure 4.	Effect of Billet Nose Shape and Fluid on Pressure-Displacement Curves Obtained in the Hydrostatic Extrusion of 7075-0 Aluminum at a Ratio of 40:1	10
Figure 5.	Billet Nose Designs Evaluated in Hydrostatic Extrusion	11
Figure 6.	Tandem Billet Joint Designs Evaluated in Hydrostatic   Extrusion	12
Figure 7.	Standard Die Profile and Two Dies Designed to Eliminate Cracking of Hydrostatic Extrusions	18
Figure 8.	Influence of Die Design and Extrusion Ratio on Cracking of Hydro- static Extrusions of Wrought TZM Molybdenum Alloy	20
Figure 9.	Influence of Extrusion Ratio on the Extrusion Fluid-Runout Pressure for Wrought TZM Molybdenum Alloy	21

D