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Skid Sensitivity of As-Pressed LX-10-1 and PBX 9501

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DEVELOPMENT DIVISION
NOVEMBER 1980

MASTER

Process Development
Endeavor No. 301

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NOTICE

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ABSTRACT

The skid sensitivities of as-pressed LX-10-1 and PBX 9501 were determined. Both materials were found to be more sensitive in the as-pressed condition than standard machined hemispheres. A modified billet configuration (boss offset from pole position) was used for the as-pressed tests.

INTRODUCTION

Skid test series were conducted to determine the difference in sensitivity between as-pressed and machined billets of LX-10-1 and PBX 9501. A modified billet configuration (boss offset) was used for the as-pressed tests. This configuration permitted the parts to be dropped with the equator horizontal and closely approximates standard skid test conditions. The as-pressed skid tests were not accelerometer instrumented.

PBX 9404 was previously tested using two different types of as-pressed billets(*1*) (see Fig. 1). Modified billets (same type as used for the current tests) indicated a sensitivity comparable to machined hemispheres. Standard as-pressed billets of PBX 9404 were also tested (with a 33° forward tilt) but these exhibited a drastic increase in sensitivity. The 33° forward tilt was necessary to avoid impact on the scored area where the boss was removed from the pole of the billets.

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[1] *Skid Sensitivity of As-Pressed PBX 9404, October 1979, Jim A. Crutchmer, MHSMP-79-50.*

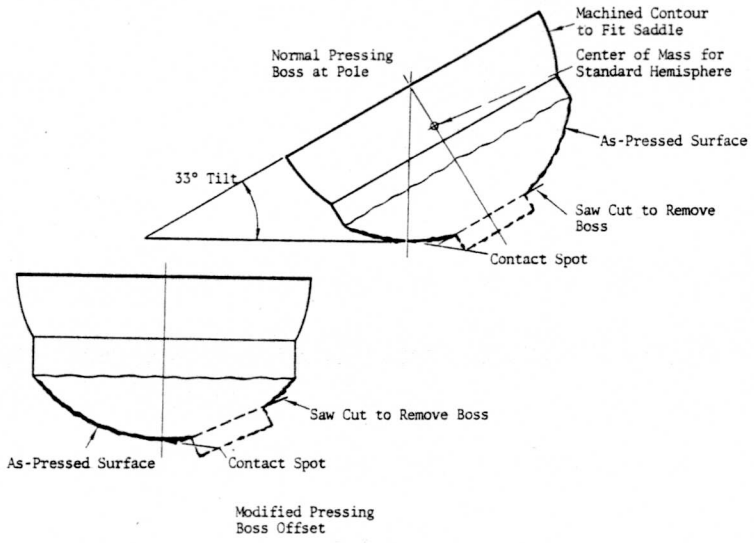

Fig. 1. Schematics of As-Pressed PBX 9404

The as-pressed billets of LX-10-1 were fabricated from Lot No. 77F650-003 (94.48% HMX/5.52% Viton). Billet weight was 11.8 kg compared to a weight of 10.6 kg for machined hemispheres. Density of the as-pressed billets was 1.865 Mg/m^3. The PBX 9501 as-pressed billets were fabricated from Lot No. 77H685-003 (94.93% HMX/2.43% Estane/2.64% NP). The as-pressed billets weighed 11.7 kg with a nominal density of 1.823 Mg/m^3 while standard machined hemispheres of PBX 9501 weighed 10.4 kg.

DISCUSSION

The critical heights determined for standard machined LX-10-1 (normal orientation) were 0.38 m at 14° and 1.07 m at 45°. With as-pressed billets one No. 6 reaction was obtained from 4 drops at 0.19 m, 14° and at a drop angle of 45° one No. 6 reaction out of 6 drops was experienced at 0.53 m. At both drop angles six no-reactions were obtained one drop increment below the corresponding reaction heights. Table I summarizes the skid test results.

Table I. Skid Test Summary of LX-10-1 and PBX 9501

Drop Angle	Drop Height (m)	Drop Height (ft)	LX-10-1 Standard	LX-10-1 As-Pressed	LX-10-1 33° Tilt	PBX 9501 Standard	PBX 9501 As-Pressed
14°	0.09	0.31			0,0,0,0,0,0		
	0.13	0.44		0,0,0,0,0,0	0,0,0,0,0,0,0,0,0,6		
	0.19	0.63		0,0,0,6			
	0.27	0.88	0,0,0,0,0,0,0,0,0,0	6			
	0.38	1.25	0,0,0,2,6,6,6,6,6,6	6			0,0,0,0,0,0
	0.53	1.75	0,6			Ø,0,0,0,0,0,0	0,0,0,0,3
	0.76	2.50				Ø,0,0,3	0,3
	1.07	3.50				0,0,0,0,0,0,3	
	1.52	5.00				0,3	
	2.16	7.10				3	
45°	0.19	0.63			0,0,0,0,0,0		
	0.27	0.88			0,0,0,0,6		
	0.38	1.25		0,0,0,0,0,0	0,0,0,6		
	0.53	1.75		0,0,0,0,0,6	0,6		
	0.76	2.50	0,0,0,0,0,0,0,0,0,0	0,6			
	1.07	3.50	0,0,0,0,0,0,0,0,0,6,6,6	6			
	1.52	5.00	6				0,0,0,0,0,0
	2.16	7.10				0,0,0,0	0,0,0,0,3
	3.05	10.00				0,0,0,0,0,0	0,0,3
	4.30	14.10				Ø,0,0	4
	6.10	20.00				0,0,0,0,0,0,0,0	
	8.53	28.00				0,0	

Ø No Test, Bad Hit

Those parts remaining from the above series were reused to determine the effect of the 33° forward tilt on the sensitivity of as-pressed LX-10. As shown in Table I, there was a further increase in sensitivity compared to the as-pressed billets dropped in the normal orientation. However, these parts were modified billets (boss offset) and results may differ from those of standard as-pressed billets dropped with a tilted orientation.

Standard machined PBX 9501 gave a critical height of 0.76 m at the 14° drop angle. No reactions were obtained at the 45° drop angle. The critical height at 45° for PBX 9501 is presented as >6.10 m. Only two drops were made at 8.53 m which is the limit of the facility because of the difficulty in hitting the target. These two billets did not crack but were severely deformed around the contact area.

At the 14° drop angle one No. 3 reaction out of five drops was obtained at 0.53 m with as-pressed billets. This is one drop increment below the critical height of machined PBX 9501. One No. 3 reaction out of five drops was obtained at 2.16 m, 45°. All reactions with PBX 9501, both machined and as-pressed, were low-order No. 3 reactions with the exception of one No. 4 at 4.30 m, 45° with as-pressed material. The critical height/reaction data for LX-10 and PBX 9501 are shown in Table II.

Table II. Skid Test Critical Height/Reaction Data For Machined Versus As-Pressed LX-10-1 and PBX 9501

Explosive	Condition	Drop Angle	Critical Height (m)	Critical Height (ft)	Reaction
LX-10-1	Standard Machined Hemispheres	14°	0.38	1.25	6
		45°	1.07	3.50	6
	As-Pressed Billets Normal Orientation	14°	0.19	0.63	6
		45°	0.53	1.75	6
	As-Pressed Billets 33° Tilt	14°	0.13	0.44	6
		45°	0.27	0.88	6
PBX 9501	Standard Machined Hemispheres	14°	0.76	2.50	3
		45°	>6.10	>20.00	0
	As-Pressed Billets Normal Orientation	14°	0.53	1.75	3
		45°	2.16	7.10	3

A summary of these tests is shown in Fig. 2 along with results of previously reported as-pressed PBX 9404 data(*1*).

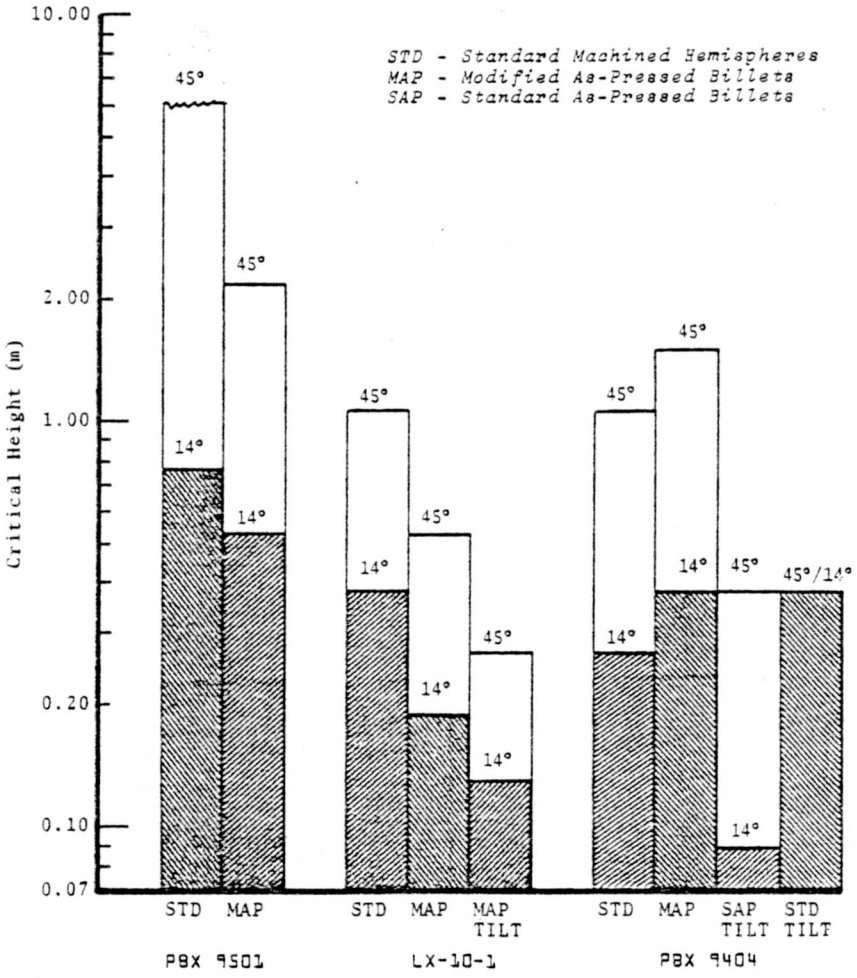

Fig. 2. Critical Heights of Standard vs As-Pressed Billets

CONCLUSIONS

As-pressed billets of LX-10-1 and PBX 9501 are significantly more sensitive than their machined counterparts. The critical heights of as-pressed LX-10 (normal orientation) were two drop increment lower in reaction heights than for machined LX-10 billets.

The critical heights of as-pressed LX-10-1 dropped with the 33° forward tilt are 0.13 m, 14° and 0.27 m, 45°. Although results of these tests (33° tilt) are similar to PBX 9404(*1*), a direct comparison of the two materials tested under these conditions can not be made because of the difference in the type of as-pressed billets used.

The critical height of as-pressed PBX 9501 at the 14° drop angle was only one drop increment lower than machined parts. However, at the 45° drop angle the critical height for as-pressed billets is 2.16 m compared to no reaction at 6.10 m for machined parts.

Similar testing of PBX 9404 indicates modified as-pressed billets are equal to or slightly less sensitive than machined parts when tested in the normal orientation, i.e., with the equator horizontal(*1*). PBX 9501 was not tested with the tilted orientation. It is expected that this material would exhibit a similar increase in sensitivity as PBX 9404 and LX-10-1 if tested under this extreme condition.

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