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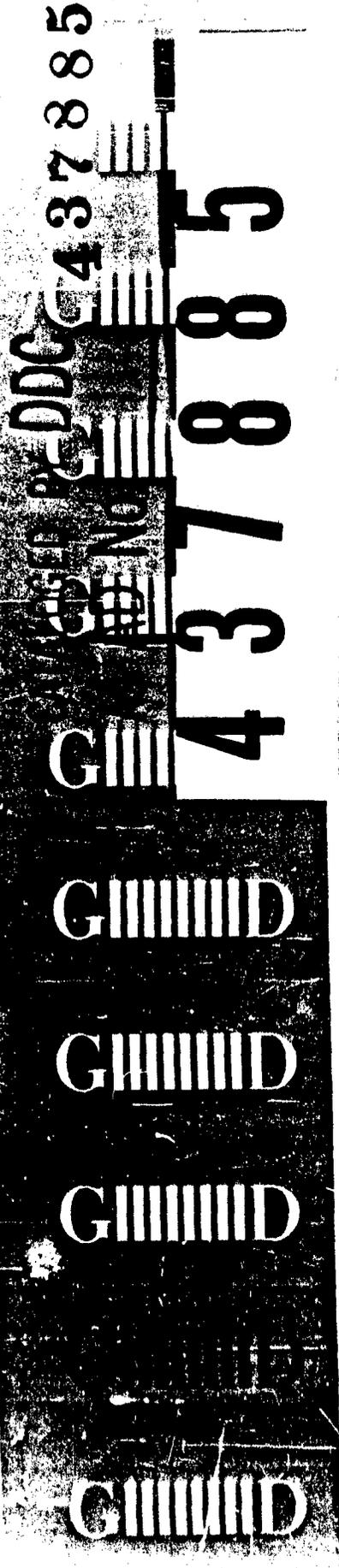
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FTDM-3135
15 April 1964



**MATERIAL - EVALUATION - CHARPY IMPACT STRENGTH
D6AC AND 4330-V STEEL ALLOY**

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GENERAL DYNAMICS | FORT WORTH

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TEST DATA MEMORANDUM

PTDM NO. 3135
 MODEL F-111
 TEST NO. 30-2890

TEST: MATERIAL - EVALUATION - CHARPY IMPACT STRENGTH D6AC AND 4330-V STEEL ALLOY

OBJECT: Determine the Charpy impact strength of D6ac and 4330-V alloy steel at R.T. and -65°F.

PROCEDURE: Eighteen specimens were prepared for Charpy "V" notch impact tests per drawing FTJ-10940-100 shown as Figure 1. The material for the six "A" series 4330-V specimens came from a T2-V configuration forging. These specimens, representing the longitudinal direction, were taken from a 2-1/4" diameter section which protruded from the forging proper. This forging was of lower carbon content, approximately .30C, and was given a double draw at 500°F to obtain a hardness of between 45.5 and 46 Rc.

The "B" series 4330-V specimens were taken from the grip section of fracture toughness specimen number 4-22 tested under test 30-2618. The specimens represent the long transverse direction of a 4" x 12" forged billet. The "H" series D6ac specimens were taken from 4" x 12" billet "DB", reference test 30-2682. These specimens represent the long transverse direction of the billet. In heat treating, the specimens were given the 950°F shelving treatment*. All specimens were ground to the finished configuration after heat treatment. The ground notches were polished with a rotating wire and silicon carbide slurry after grinding. After polishing, the specimens were stress-relieved at 400°F for 2 hours. Testing was conducted on a Riehle Model Pl-2 impact testing machine using the 60 foot-pound range. A mixture of M.E.K. and dry ice was maintained between -68 and -70°F to cool the specimens prior to test.

RESULTS: The test results are given in Table I.

DISCUSSION: The specimens tested under this test program were ground to the correct dimensions. The thickness at the base of the specimen notches was within ±.001" on the .315" dimension and the notch radius was .010".

Specimens machined from the failed 4330-V fracture toughness specimens had low impact strengths. The average value of 8 foot-pounds is in agreement with the results obtained under test 30-2752. The 4330-V specimens machined from the T2-V forging protrudance had high impact strengths, averaging better than 15 foot-pounds at both R.T. and -65°F. This protrudance received a considerable amount of hot working which probably explains the very high R.T. impact values. Specimens machined from the D6ac billet also averaged better than 15 foot-pounds impact strength at both R.T. and -65°F. One-third the -65°F test values were below 15 foot-pounds for both the D6ac billet and 4330-V T2-V forging specimens. Increasing the specimen thickness at the base of the notch from .295" (Ref. 30-2752) to .315" increase both the R.T. and -65°F impact strength of the D6ac by about 2 foot-pounds.

CONCLUSIONS: Both the well forged 4330-V (longitudinal direction) and D6ac billet material (long-transverse direction) exceeded an average of 15 foot-pounds Charpy "V" notch impact strength at R.T. and -65°F.

WITNESS:

DATE: 2 July 1963
 *Reference FTDM 3130 submitted
 by AF33(657)-11214.

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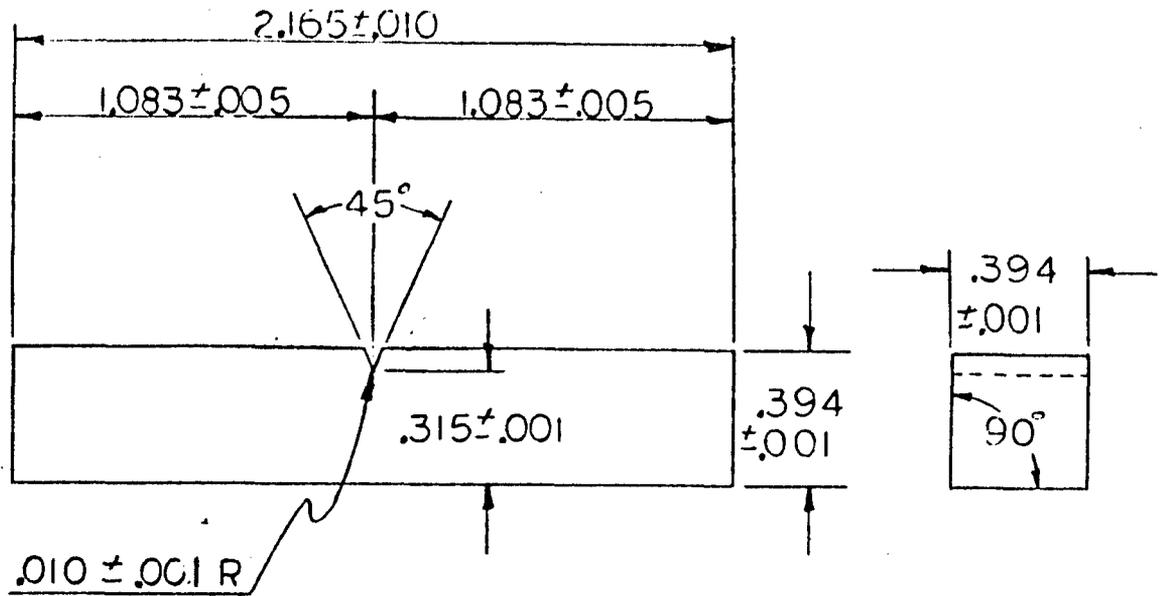
CONVAIR—FORT WORTH
TABULATION SHEET
TABLE I - CHARPY "V" NOTCH IMPACT TEST RESULTS.

SPECIMEN NO.	AVERAGE HARDNESS	EQUIV. KSL	TEST TEMP.	IMPACT STRENGTH	AVG. R.T.	AVG. -65F	TEMPERING TEMP.
	Rc	F _{TU}		F ₁₆			2 Hr. → 2 Hr @
4330-V							
SERIES "A"							500°F
T2-V FORGING	45.8	219.	R.T.	25.0			
LONG. DIRECTION			"	24.0			
			"	27.0	25.3		
			-65F	15.4			
			"	12.2			
			"	20.9		16.2	
SERIES "B"							625°F
F.T. SPEC. 4-22	46.0	221	-65°F	8.2			
L.T. DIRECTION			"	8.2			
			"	7.7		8.0	
D6ac							1025°F
SERIES "H"							
4x12 BILLET	48.3	239	R.T.	16.1			
L.T. DIRECTION			"	19.6			
			"	18.2	18.0		
			-65°F	14.8			
			"	17.3			
			"	18.4			
			"	14.5			
			"	16.2			
			"	16.8		16.3	

Previous testing (FTDM-3130) indicated that SAE 4330-V steel has a lower impact strength when tempered in the 600°F (so called blue brittle) range. It was intended to temper the "A" series specimens in this range, but based on hardness measurements made during heat treating, this was not possible and the specimens were tempered at 500°F. In this tempering range, higher impact strengths are obtained.

The D6ac was tempered at 1025°F which is in the middle of the tempering range called out in FPS-1029. Tempering at a higher temperature to lower the ultimate tensile strength to 220 ksi would have caused an increase in impact strength.

* Reference FTDM-3130 submitted by AF33(657)-11214.



NOTES:

1. Unless otherwise specified tolerances are as follows:
 Linear dimensions - .xx ± .03 .xxx ± .010
 Angular dimensions - ± 0° - 30'
2. Material to be as specified.
3. Grain direction to be longitudinal unless otherwise specified.
4. Finish \checkmark all over.

Figure 1

DRAWN		DATE		IMPACT TEST SPECIMEN 'V' NOTCH Charpy CONSOLIDATED VULTEC AIRCRAFT CORPORATION FORT WORTH DIVISION - FORT WORTH, TEXAS	FTJ-10040-100
CHECKED					Scale-Double
ENG.					
PROJECT					

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