



## BRAKE AND OLEO STRUT SYSTEM FLUID USAGE

NOTICE: The table below shows the type of brake fluid used in airplanes manufactured by the Piper Aircraft Corporation, however, due to airplanes being manufactured both with and without brakes and field installation and conversions being made to different type brake units, we recommend that if blue fluid (which has a vegetable or castor oil base), has been used in the system, it is safer to continue its use, to avoid the possibility of damage to the brake expander tubes, which will occur if red or amber fluid (mineral or petroleum base) is used with an expander tube not intended for this type of fluid. (See below for identification markings of different types of expander tubes.)

Name	Model	Army Designation	Navy Designation	Fluid Brake System	Fluid Oleo Struts
Coupe	J4	L4-E	None	*	Houdaille
Trainer	J3	L4-A, B, H, J	NE-1	**	None
Trainer	PA-11	None	None	**	None
Vagabond	PA-15	None	None	**	None
Vagabond	PA-17	None	None	**	None
Cruiser	J5	None	None	*	None
Cruiser	J5-C	None	AE-1	**	None
Super Cruiser	PA-12	None	None	**	None
Family Cruiser	PA-14	None	None	**	None
Super Cub	PA-18-18A	None	None	**	None
Pacer - Tri-Pacer	PA-20-22	None	None	**	**
Apache	PA-23	None	None	**	**

### BRAKE FLUID

### OLEO FLUID

\* Lockheed #21 (Color-blue) Piper No. (Qt.) - 750 209, (Gal.) - 750 210 Qt. Piper No. 750 212

\*\* Univis #40 (Color-red)(or amber) Piper No. (Qt.) - 750 874, (Gal.) - 750 875 Gal. Piper No. 750 213

### SPECIAL REMARKS: - DRY OR FLUSHED SYSTEM

\* Our records show Lockheed #21 fluid used in all airplanes built with brakes as standard equipment through 1941.

\*\* Our records show Univis #40 fluid used approximately from 1942 on.

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Brake master cylinders, (other than the Scott Model B-711 single unit type for which either mineral or petroleum base fluid is recommended), could have either natural or synthetic rubber cups. However, since the natural rubber cups have been extinct since 1941, it is assumed that they have been replaced with synthetic cups which would require the use of Univis #40 fluid.

Considering the above, plus the fact that master cylinder cups are less expensive than are expander tubes, it is suggested that fluid recommended for use with the expander tubes be used in unmarked expander tubes, or those bearing blue identification explained below.

#### BRAKE SHOE - EXPANDER TUBE FLUID IDENTIFICATION MARKING

According to information received from the B. F. Goodrich Company, manufacturer of the expander tubes, approximately November 1943 all expander tubes were painted with a red or blue stripe on the O.D. directly over the nozzle. The red stripe signified tubes suitable for use with mineral or petroleum base fluid, or Univis #40, and the blue stripe signified tubes suitable for use with vegetable base or Lockheed #21 fluid.

Lockheed #21 fluid, only, should be used with natural rubber expander tubes. Tubes that do not have any painted stripes on the O.D. should be used with Lockheed #21 to be safe.

Approximately January 1, 1945, a silver stripe was added to show that the tube was suitable for operation down to  $-65^{\circ}$  F., and could be used with mineral or petroleum base fluid to specification AN-VVO-866 (Univis #40).