

**CONTINENTAL MOTORS® AIRCRAFT ENGINE
CRITICAL SERVICE BULLETIN**
Compliance Necessary to Maintain Safety

CATEGORY 2

CSB98-1C

Supersedes CSB98-1B
TECHNICAL PORTIONS
FAA APPROVED


SUBJECT: INTAKE AND EXHAUST VALVE INSPECTION

PURPOSE: Continental Motors (CM) has recently investigated and confirmed reports of abnormal wear on the hardened wear tip of seven (7) valves. These seven (7) valves are from the approximately 200,000 valves manufactured by TRW, Inc. for CM between January 1, 1996 and March 31, 1998. In each instance the abnormally worn valve exhibited signatures indicative of improper heat treatment of the valve wear tip during the manufacturing process. During our investigation, valves in stock at CM and its distributors (approximately 8,000 valves) were checked for hardness of the wear tip and a total of 43 valves in stock were found to be below minimum specifications for hardness. While these valves represent a very small portion of the valves received by CM during the time period in question, CM is committed to insuring high levels of quality, product integrity and safety and is, therefore, issuing this service bulletin. While no engine failures have been reported to CM to date as a result of this condition, the possibility of accelerated valve tip wear leading to engine damage or failure does exist. This bulletin requires the inspection of each valve, cylinder assembly, and engine supplied by CM during the time periods designated in Table 1 of the COMPLIANCE section of this service bulletin, as well as any engine that has been overhauled or repaired using a valve or cylinder assembly supplied by CM during the designated time periods. Although CM believes that the probability of significant numbers of valves with improperly heat treated wear tips in the field is low, it is essential that such valves be found and removed from service. This service bulletin provides the compliance requirements and inspection procedures for inspecting all valves, cylinder assemblies and engines manufactured, overhauled, or repaired utilizing valves supplied during the time periods designated in Table 1 of the COMPLIANCE section of this service bulletin. Complete the inspection, as listed following complete.

WARNING

Any valve with tip hardness below minimum specification is subject to accelerated wear which could result in engine damage or failure.

COMPLIANCE: As designated in Table 1

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NOTE: The following cylinder assemblies (cylinders with part numbers suffixed by the letter “A” and a number, e.g.: 654928 A 3) are in compliance with this service bulletin. Part number: 654928, 654958, 954959, 654960, 654961, 654962, 654963, 654965, 654966, 654967, 654968, 654969, 654970, 654971, 654974

TABLE 1

This service bulletin affects valves, cylinders assemblies and engines (listed by engine model) purchased from CM during the time periods designated in the following table. Refer to Table 2 under “Models Affected” for serial number effectivity for CM new and rebuilt engine.


VALVE TIP INSPECTION REQUIRED BY ENGINE MODEL AND PURCHASE DATE			
ENGINE MODEL	PURCHASE DATE OF AFFECTED VALVE, CYLINDER ASSEMBLY OR ENGINE	ENGINE MODEL	PURCHASE DATE OF AFFECTED VALVE, CYLINDER ASSEMBLY OR ENGINE
C-75, 85,90 O-200-A & B	1/1/96 to 5/15/98	IO-470-ALL	1/1/96 to 3/31/98
O-240-ROLLS-ROYCE	1/1/96 to 5/15/98	TSIO-470-ALL	1/1/96 to 3/31/98
O-300-A,B,C, & D	1/1/96 to 5/15/98	IO-520-ALL	1/1/96 to 3/31/98
GO-300-ALL	1/1/96 to 5/15/98	TSIO-520-ALL	1/1/96 to 3/31/98
IO-240-A & B	1/1/96 to 5/15/98	LTSIO-520-ALL	1/1/96 to 3/31/98
IO-346-A	1/1/96 to 3/31/98	GTSIO-520-ALL	1/1/96 to 3/31/98
IO-360-ALL	1/1/96 to 5/15/98	IO-550-ALL	1/1/96 to 3/31/98
TSIO-360-ALL	1/1/96 to 5/15/98	TSIO-550-ALL	1/1/96 to 3/31/98
LTSIO-360-ALL	1/1/96 to 5/15/98	TSIOL-550	1/1/96 to 3/31/98
E-Series	1/1/96 to 3/31/98	GIO-550-ALL	1/1/96 to 3/31/98
O-470-ALL	1/1/96 to 3/31/98		

CAUTION:

Any affected engine or any engine which has been overhauled or repaired utilizing an affected valve or cylinder assembly experiencing audible valve lifter clatter must comply with Part 3 of this service bulletin within the next 10 hours of engine operation. Valve lifter clatter may be the result of increased clearances resulting from valve tip wear.

1. Service spare valves and cylinder assemblies in inventory must be inspected on receipt of this bulletin. Comply with Part 1 or Part 2 as applicable.
2. New and rebuilt affected engines and engines that have been overhauled or repaired utilizing affected valves or cylinder assemblies with more than 200 hours total time in service but less than 400 hours total time in service must be inspected within the next 100 hours of operation, but not later than the next annual inspection. Comply with Part 3 and Part 4.

NOTE: Due to the variations in wear rates of improperly heat treated valve tips, unless audible valve lifter clatter is noted or reported, do not inspect affected engines with less than 200 hours of operation.

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3. New and rebuilt affected engines and engines that have been overhauled or repaired utilizing affected valves or cylinder assemblies with more than 400 hours total time in service must be inspected within the next 50 hours of operation. Comply with Part 3 and Part 4.

4. Overhauled and repaired cylinders installed on any engine incorporating valves purchased from CM during the time period designated in Table 1 must be inspected in accordance with the criteria stated in item 2 or 3 above, as applicable. Comply with Part 3 and Part 4.

MODELS

AFFECTED: ALL AS SPECIFIED IN TABLE 1 and TABLE 2.

TABLE 2

ENGINE MODEL	REBUILT S/N	NEW S/N	ENGINE MODEL	REBUILT S/N	NEW S/N
O-200-A	285406-285499 814000-841020	256046-256051	IO-360-DB IO-360-ES	808760-808788 NONE	351394 357049;357051; 357053-357068; 357070;357083; 357087-357093; 357097-357109
O-300-A,, O-300-C, O-300 D	016112 230830; 230831 025676-025692.	NONE NONE NONE	IO-360-G IO-360-GB	244585-244603 236694-236699 813001-813011	NONE 352962; 352964; 352967; 352968
IO-240-A IO-240-B	NONE NONE	NONE 806166, 806167; 806508; 806509 806565;806686- 806689;806693; 806695-806714; 806814-806832; 806843-806848; 806851;806900; 806930-806933; 806937-806939; 806942;806944; 806951-806955;	IO-360-H IO-360-HB IO-360-J IO-360-JB IO-360-K IO-360-KB	226575-226581 265191-265195 238726-238731 292504, 292505 240135-240139 288634-288712	NONE 358021-358024 NONE NONE NONE NONE
IO-360-A IO-360-C IO-360-CB IO-360-D	020136-020139 060645-060684 236523-236526 062999-063027	NONE NONE NONE NONE	TSIO-360-A TSIO-360-AB TSIO-360-C TSIO-360-CB TSIO-360-E TSIO-360-EB TSIO-360-F TSIO-360-FB	197112-197120 237615-237616 283546-283558 236230-236246 225147-225150 809002;809036- 809208 232819 299572-299688	NONE NONE NONE 300673-300676 NONE 311753-311754 NONE NONE 318021-318022


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TABLE 2 (CONTINUED)

ENGINE MODEL	REBUILT S/N	NEW S/N	ENGINE MODEL	REBUILT S/N	NEW S/N
TSIO-360-H	233273-233278	NONE	O-470-S	269375-269458	464587
TSIO-360-HB	239976-239982	NONE	O-470-U	809770-809999	470755-470758
TSIO-360-JB	NONE	313036; 313037		810000	
TSIO-360-KB	268237-268249 811251-811309	320336-320339; 320342-320344; 320348-320349; 320351;320353- 320355;320357- 320363;320366- 320367;320371- 320380		813254-813355	
TSIO-360-LB	247300-247349	NONE	IO-470-C	295529-295549	NONE
TSIO-360-MB	279268-279288	317257; 317258; 317260;317268- 317279	IO-470-D	105630-105641	NONE
TSIO-360-RB	NONE	321325-321330; 321349-321363; 321406-321460	IO-470-E	088756-088763	NONE
TSIO-360-SB	NONE	321753-321758; 321761-321770; 321773-321774; 321777-321778	IO-470-F	089873-089915	NONE
			IO-470-H	087343	NONE
			IO-470-J	089123-089126	NONE
			IO-470-K	092971-092990	NONE
			IO-470-L	297605-297797	468598-468600; 468602-468605
			IO-470-M	094591	NONE
			IO-470-N	096638-096703	458162-458171
			IO-470-S	109363-109385	NONE
			IO-470-U	118450-118453	NONE
			IO-470-V	171138-171197; 171199	NONE
LTSIO-360-E	225656-225660	NONE	IO-520-A	112768-112818	NONE
LTSIO-360-EB	807320-807479; 807481-807485	312735-312736	IO-520-B	234771-234782	NONE
LTSIO-360-KB	812001-812044 268471-268499	319343-319346; 319351-319353; 319355;319358- 319359;319361; 319363-319371; 319374;319378- 319385;	IO-520-BA	807099-807250 814256-814298	NONE
LTSIO-360-RB	NONE	321576-321581; 321601-321615; 321658-321712	IO-520-BB	809556-809750 813755-813850	580048-580062
O-470-G	070701-070703	NONE	IO-520-C	287426 287498	NONE
O-470-J	202196-202209	NONE	IO-520-CB	810751-810970 298637-298986; 298988-298993	576319-576321
O-470-K	049478-049496	NONE	IO-520-D	293314-293499 812751-812879; 812891-812944	575921-575934
O-470-L	069829-069882	NONE	IO-520-E	215849-215907	NONE
O-470-M	054154	NONE	IO-520-F	810025-810250 812212-812500 814250-814790	579231;579233; 579234-579242; 579244; 579245;
O-470-R	288418-288499 811751-811969	466721-466729	IO-520-J	216526-216532	NONE
			IO-520-K	224115-224134	NONE
			IO-520-L	294670-294875; 294877-294888	577222-577230
			IO-520-M	270967-270999 811501-811598	NONE
			IO-520-MB	277561-277693	575059; 575060


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ENGINE MODEL	REBUILT S/N	NEW S/N	ENGINE MODEL	REBUILT S/N	NEW S/N
LTSIO-520-AE	246643-246666	524341	TSIO-520-UB (continued)		527365;527366; 527393; 527417; 527418
TSIO-520-AE	246136-246163	NONE	TSIO-520-VB	290434-290499	529107-529113
TSIO-520-AF	245232-245247	525102		811001-811193;	
TSIO-520-B	176681-176753	NONE		811195-811228	
TSIO-520-BB	287565-287592	526043-526044	TSIO-520-WB	274339-274424	518933-518934
TSIO-520-BE	273790-273809	NONE			
TSIO-520-C	178478-178536	501634			
TSIO-520-CE	268563-268577	530166-530167	GTSIO-520-C	155564-155565	NONE
TSIO-520-D	180103-180109	NONE	GTSIO-520-D	219468-219475	NONE
TSIO-520-DB	242013-242014	NONE	GTSIO-520-H	267387-267479	607109-607110
TSIO-520-E	275430-275499	NONE	GTSIO-520-K	226133,226135	NONE
	812502-812582; 812584		GTSIO-520-L	292131-292315	608764-608765
TSIO-520-EB	271380-271499	510838-510842	GTSIO-520-M	276491-276499	613077-613080;
	815001-815009; 815011-815014		GTSIO-520-N	810501-810626	613083
TSIO-520-G	216048-216052	507070		808268-808318	NONE
TSIO-520-H	217360-217404	506893	IO-550-A	280416-280473	NONE
TSIO-520-J	218976-218987	NONE	IO-550-B	296777-296999	682133; 682134;
TSIO-520-JB	237177-237184	NONE		297000-297053	682225;682233- 682237; 682248;
TSIO-520-K	224607	NONE			682249; 682250;
TSIO-520-KB	245710-245712	NONE			682252-682304;
TSIO-520-L	241963-241970	NONE			682356-682364;
TSIO-520-LB	237288-237300	NONE			682385-682391;
TSIO-520-M	291706-291950	532050;532051; 532053-532055; 532057-532065; 532067-532081			682536; 682537; 682609-682634; 682768-682770;
TSIO-520-N	228625-228639	521659-521661;			682787-682826;
TSIO-520-NB	290853-290999	521664;521665			682952-682959;
	813501-813571; 813573-813589				682962-683001;
TSIO-520-P	278735-278810	513920			683003; 683005
TSIO-520-R	293705-293955; 293957-293975	522684-522696			683938-683945;
TSIO-520-T	239424-239464	515438; 515439	IO-550-B (33)	NONE	913001;913008
TSIO-520-UB	249092-249100 809301-809335	527242;527243; 527246-527252 527260; 527265; 527266;527284 527297; 527299; 527300-527303; 527329-527335; 527360-527363	IO-550-C	271983-271989 810281-810500 815251-815258	676870; 676937; 676938; 676946-676999 683101-683107; 683130; 683131; 683168-683172;



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TABLE 2 (CONTINUED)

ENGINE MODEL	REBUILT S/N	NEW S/N	ENGINE MODEL	REBUILT S/N	NEW S/N
IO-550-C (continued)		683178; 683179;	TSIO-550-A	NONE	NONE
		683196-683200;	TSIO-550-B	NONE	802088;802111- 802113;802118; 802123;802124
IO-550-D	284181-284278	683263; 683272;	TSIO-550-C	814501-814502	802529;802531; 802533-802581;
		683344-683352;			
IO-550-E	283327-283381	683401-683419;			
		683532-683535;			
IO-550-F	284717-284849	683545;683550-	TSIOL-550-C	NONE	NONE
		683581;683696-			
IO-550-G	808503-808507	683701;683706-			
		683741;683866-			
IO-550-L	289083-289130	683867;684159-			
		684166			
IO-550-N	NONE	680015-680016			
		NONE			
		683351-683352			

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NOTE: The following cylinder assemblies (cylinders with part numbers suffixed by the letter “A” and a number, e.g.: 654928 A 3) are in compliance with this service bulletin. Part number: 654928, 654958, 954959, 654960, 654961, 654962, 654963, 654965, 654966, 654967, 654968, 654969, 654970, 654971, 654974.

GENERAL INFORMATION:

NEW ENGINES INSTALLED IN NEW AIRCRAFT HAVE BEEN INSPECTED BY ACTUAL HARDNESS TESTING OF THE VALVE WEAR TIP AND ARE IN COMPLIANCE WITH THIS SERVICE BULLETIN. REFER TO THE ENGINE LOG BOOK FOR COMPLIANCE, NO “V” HAS BEEN STAMPED ON THE CYLINDER FLANGES.

CYLINDERS IDENTIFIED WITH A 1/8th INCH HIGH LETTER “V” STEEL STAMPED AT THE 12 O’CLOCK POSITION ON THE CYLINDER FLANGE ARE IN COMPLIANCE WITH THIS SERVICE BULLETIN. REFER TO FIGURE 3. THESE CYLINDERS DO NOT REQUIRE ANY ADDITIONAL INSPECTION.

PART 1

UN-INSTALLED VALVES:

Inspect all un-installed valves purchased between January 1, 1996 and March 31, 1998 for the following characteristics.

1. Date code roll-stamped or vibro-etched on the valve stem between the valve keeper groove and the top of the valve. Refer to Figure 1 for location of date code. The date code will be either a two digit numerical (e.g. 3-98, etc.) or a two-digit alpha (e.g. A-U, B-U, etc.) code. Valves with roll-stamped or vibro-etched date codes as herein described have been inspected by TRW, Inc. and are in compliance with this service bulletin.


Valves in inventory that do not have roll-stamped or vibro-etched date codes between the valve keeper groove and the top of the valve must be returned to CM. Contact your CM distributor for detailed instructions on returning these items.

PART 2

UN-INSTALLED SERVICE SPARE CYLINDERS ASSEMBLIES:

Using the following procedure inspect valve (s) for a date code roll-stamped or vibro-etched on the valve stem between the valve keeper groove and the top of the valve stem. Refer to Figure 1 for location of date code.

1. Mount the cylinder in a valve spring compressing fixture.
2. Compress the intake and exhaust valve springs individually and remove each set of valve keepers, retainer (intake side), roto-coil (exhaust side), outer and inner valve springs.
3. Visually inspect the intake and exhaust valve for the existence of a date code. The date code will be either a two digit numerical (e.g. 3-98, etc.) or two-digit alpha date (e.g. A-U, B-U, etc.) code.
4. Valves with roll-stamped or vibro-etched date codes as herein described have been inspected by TRW, Inc. and are in compliance with this service bulletin.

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5. Intake and exhaust valves that are not identified with a two-digit numerical or alpha date code as herein described must be returned to CM. Contact your CM distributor for detailed instructions on returning these items.
6. Order new valves from a CM Distributor to replace valves that do not have a roll-stamped or vibro-etched date code as herein described. Insure replacement valves are identified with a roll-stamped or vibro-etched date code as herein described. Refer to Figure 1.
7. Assemble cylinder(s) with valves having roll-stamped or vibro-etched date code as herein described in accordance with the applicable CM Maintenance and Overhaul Manual. Mark cylinder flange in accordance with Figure 3, using a 1/8th inch high letter "V".

PART 3

INSPECTION OF NEW AND REBUILT AFFECTED ENGINES AND ENGINES THAT HAVE BEEN OVERHAULED OR REPAIRED UTILIZING AFFECTED VALVES OR CYLINDER ASSEMBLIES

NOTE

BEFORE PERFORMING ANY INSPECTION

REVIEW ENGINE LOGBOOK FOR ENTRY OF COMPLIANCE WITH CSB98-1 (ANY REV.)

OR

INSPECT CYLINDER BASE FLANGE FOR PRESENCE OF LETTER "V" STAMPED AT 12 O'CLOCK POSITION. CYLINDERS STAMPED WITH LETTER "V" HAVE BEEN INSPECTED AND ARE IN COMPLIANCE WITH THIS SERVICE BULLETIN

Refer to the COMPLIANCE section of this bulletin for specific compliance requirements.

DETAILED INSPECTION:


To perform the required inspection, remove the engine cowling to gain access to the engine.

Remove engine baffling as required to facilitate removal of cylinder(s) rocker covers.

With rocker cover(s) removed from cylinder(s) and the rocker arms removed, visually and dimensionally inspect the intake and exhaust valve wear tips for evidence of abnormal wear. Refer to Figure 1 and 2, and Table 3.

Perform a dimensional inspection in accordance with the following instructions.

1. Using a calibrated depth micrometer or Vernier caliper, measure and record the distance from the upper surface of the valve tip to the top of the valve keepers. Refer to Figure 2
2. Refer to Table 3 and determine the minimum and nominal dimension "X" for the specific engine.
3. Cylinder assemblies having valves with measurements less than the minimum dimension "X" specified in Table 3 or showing rolled material on the outer edge of the wear tip must be removed from the engine. Refer to the applicable CM engine Maintenance and Overhaul Manual for specific instructions on cylinder removal.
4. On valves requiring replacement, inspect rocker arms foot for abnormal wear. Rocker arms exhibiting abnormal wear to the foot surface must be repaired or replaced. Refer to the applicable CM engine Maintenance and Overhaul Manual for specific inspection, repair or replacement instructions.

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5. Assemble cylinder(s) with valves having roll-stamped or vibro-etched date code as described in Part 1 in accordance with the applicable CM Maintenance and Overhaul Manual. Mark cylinder flange in accordance with Figure 3, using a 1/8th inch high letter “V”.
6. Install cylinder assemblies incorporating valves with roll-stamped or vibro-etched date codes as described in Part 1 in accordance with the applicable CM Maintenance and Overhaul Manual.

NOTE: Refer to the latest revision of M-0, Standard Practice Maintenance Manual for fastener Torque Limits and torquing procedures.

7. Cylinder assemblies having valves with measurements greater than specified in Table 2 meet the inspection requirements of this service bulletin and may be continued in service. Using new gaskets and seals re-assemble the engine in accordance with the applicable CM engine Maintenance and Overhaul Manual.
8. Mark the cylinder with a 1/8th inch high letter “V” at the 12 o’clock position on the cylinder base flange, indicating compliance with this service bulletin. Refer to Figure 3.

Re-install all engine baffles in accordance with the instructions provided by the aircraft manufacturer.


Re-install any aircraft or engine mounted accessories removed to facilitate the inspection in accordance with the aircraft manufactures instructions.

Re-install the engine cowling in accordance with the aircraft manufacturer’s instructions.

PART 4

Perform a complete engine ground run verifying the engine meets all performance criteria mandated by the aircraft manufacturer. Inspect the engine, engine nacelle and adjacent areas for evidence of flammable fluid leaks. Correct any discrepancies noted before returning the engine and aircraft to service.

Make a log book and maintenance record entry indicating compliance with this service document.

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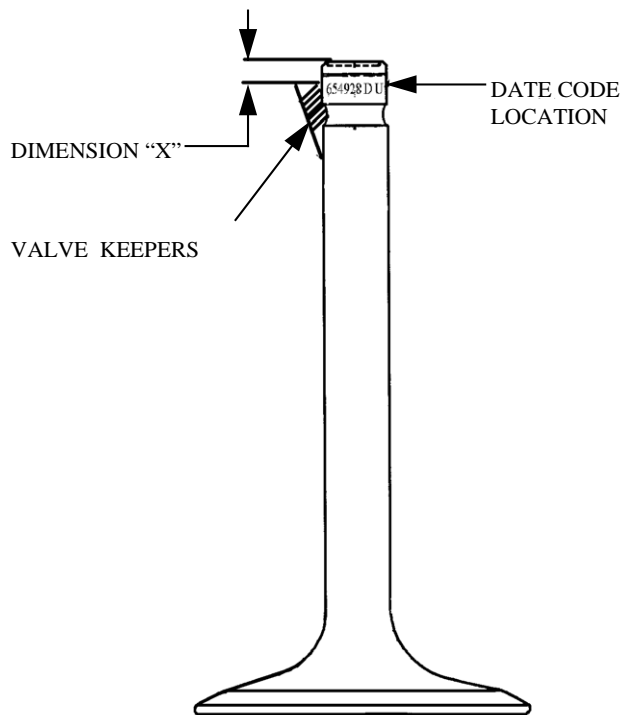

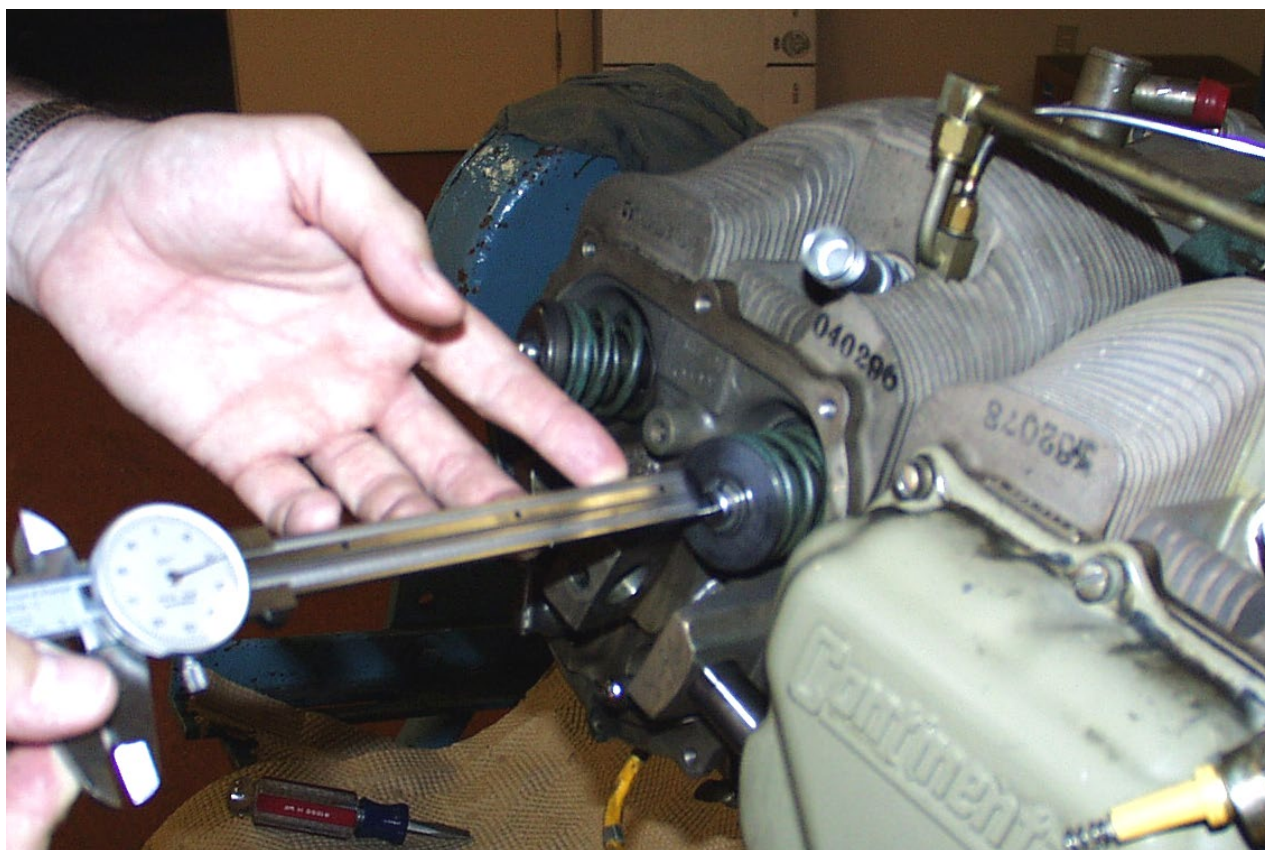


FIGURE 1


TABLE 3
VALVE TIP TO KEEPER DIMENSIONS

VALVE TIP TO KEEPER DIMENSION					VALVE TIP TO KEEPER DIMENSION				
ENGINE MODEL	DIMENSION "X"				ENGINE MODEL	DIMENSION "X"			
	EXHAUST		INTAKE			EXHAUST		INTAKE	
	MIN	NOM	MIN	NOM		MIN	NOM	MIN	NOM
C-75, 85,90 O-200-A & B	.070	.093	.060	.093	IO-470-ALL	.110	.132	.100	.132
0-300-A, B & C	.070	.093	.060	.093	TSIO-470-ALL	.110	.132	.100	.132
GO-300-ALL	.070	.093	.060	.093	IO-520-ALL	.110	.132	.100	.132
0-240 & IO-240-ALL	.052	.076	.052	.076	TSIO-520-ALL	.110	.132	.100	.132
IO-346-A	.110	.132	.100	.132	LTSIO-520-ALL	.110	.132	.100	.132
IO-360-ALL	.052	.076	.052	.076	GTSIO-520-ALL	.110	.132	.100	.132
TSIO-360-ALL	.052	.076	.052	.076	IO-550-ALL	.110	.132	.100	.132
LTSIO-360-ALL	.052	.076	.052	.076	TSIO-550-ALL	.110	.132	.100	.132
E-Series	.110	.132	.100	.132	TSIOL-550-ALL	.110	.132	.100	.132
O-470-ALL	.110	.132	.100	.132	GIO-550-ALL	.110	.132	.100	.132

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**FIGURE 2
MEASURING VALVE TIP TO VALVE KEEPER DIMENSION**

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MO	DAY	YEAR	MO	DAY	YEAR		11 of 12 CSB98-1	C
06	01	98	07	27	16			

LETTER "V" MUST BE STAMPED
 AT THE 12 O'CLOCK POSITION
 IN THE CENTER OF THE FLANGE
 MID DISTANCE BETWEEN THE
 ADJACENT CYLINDER DECK STUD HOLES

CYLINDERS THAT ARE IN
 COMPLIANCE WITH THIS SERVICE
 BULLETIN WILL HAVE THE LETTER
 "V" STAMPED IN THIS LOCATION

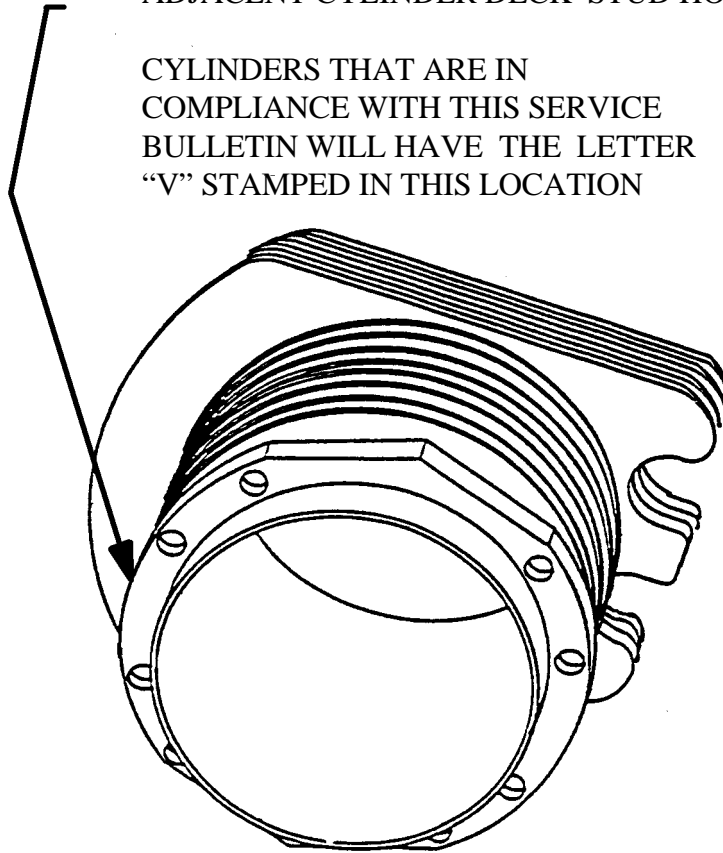



FIGURE 3
LOCATION OF COMPLIANCE MARKING

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MO	DAY	YEAR	MO	DAY	YEAR		12 of 12 CSB98-1	C
06	01	98	07	27	16			