3. Wreckage was confined to an extremely small area indicating that the aircraft struck the ground perpendicularly (attached photographs illustrate this point clearly).

4. The right wing tip was found on the left side of the line of flight, and the Number 1 engine was found where the Number 4 could have been expected; hence, it is presumed that the aircraft struck the ground in an inverted position.

5. During the last part of the flight aircraft was completely out of control (see crew statements and attached photographs).

6. Crew did not have the benefit of parachute drill out of a B-29 type airplane.

7. Part of the crew did not have parachutes accessible.

8. Discipline of the crew was poor.

9. Pilot was not oriented on the range, nor did he know his position in relation to the field.

10. In disassembly of engine Number 3 the following defects were found:

Cylinder Number 1 - Cracks on perphery of exhaust valve, guide excessively worn. Exhaust valve adjusting lock screw loose.

Cylinder Number 2 - Exhaust valve burnt, guide excessively worn.

Cylinder Number 3 - Radial crack on face of exhaust valve, guide severely worn, boss burnt.

Cylinder Number 9 - Tip of exhaust valve pounded.

Cylinder Number 11 - Tip of exhaust valve pounded.

Cylinder Number 13 - Tip of exhaust valve pounded. 490

Cylinder Number 14 - Tip of exhaust valve pounded.

Cylinder Number 17 - Exhaust valve guide severely worn, boss burnt.

11. In disassembly of engine Number 2 the following defects were found:

Cylinder Number 3 - Exhaust valve guide worn severely.

Cylinder Number 4 - Exhaust valve guide worn severely.

Cylinder Number 6 - Exhaust valve guide worn severely.

Cylinder Number 17 - Exhaust valve guide worn severely and a piece of it broken out, also burnt boss.

12. No satisfactory method of checking valves used at this field prior to accident. (See recommendations.)

13. Fuel pressure ran high on engine Number 2 during month of November operation, and no satisfactory corrective action was taken. Only action was bleeding of line.

14. Form 1A for the day before the accident could not be found.

15. A definite fire hazard exists in the fuel line from the engine driven pump to the carburetor. This hose is held on the fittings by one finger clamp at each end. High fuel pressure can easily cause gas leaks and even disconnection of this hose. (See comments and recommendations.)

16. Power settings for this flight were 43 inches Hg. and 2400 RPM during climb. After levelling off, power settings on engines Numbers 1, 2, and 4 were 31 inches Hg. and 2100 RPM, Number 3 being 30 inches Hg. and 1600 RPM until feathered. No data is available for power settings after the Number 2 engine caught on fire.

The Flight Engineer stated that fuel pressure for engine Number 2 remained normal at all times.

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22. PROBABLE CAUSE: There was poor maintenance and inspection of engines Numbers 2 and 3 of subject aircraft.

23. CONTRIBUTING FACTORS:
1. Pilot despaired of handling aircraft on two engines.
2. Pilot was not oriented on the local range.
3. Crew discipline was poor.
4. The crew had no drill in "bail out".

24. UNDERLYING CAUSE: There was lack of care and supervision in airplane maintenance and inspection.

25. COMMENTS: A man properly trained can detect a worn condition of valve guides. Had engines Numbers 2 and 3 been properly inspected for valve guide clearance, the severely worn conditions indicated above would have been found. Five minutes instruction is sufficient to demonstrate how a valve in a R3350 engine should be checked. Side clearance, not just valve clearance, is the critical check. The method must be demonstrated for the Technical Order is not clear. At several B-29 bases a valve check team has been formed. Only men on this team check valves and they know how to do it and what to look for. Where such teams have been used, cylinders have been replaced before dangerously worn valve guides have developed. The Wright Representatives are eager and ready to give instruction and every field should use their services, particularly in this respect.

High fuel pressure in the line from the engine driven fuel pump to the carburetor constitutes a serious fire hazard. The ends of this line are held in place by a finger clamp at each end. With more than eighteen pounds pressure these connections are apt to leak and even break. The line and type of connection are not satisfactory at best. The length and size of the line results in greater stress at the joints than in the smaller fuel line used in the R1820. Cold flow under the clamps allows the hose to continually work loose and a spot inspection will usually disclose several dangerously loose fuel lines on any particular base. Add to this excessive fuel pressure in the fuel line and fire becomes almost an inevitable result. (Reference is advised to Major Hart's R & R of 7 December 1944 which covers his findings on this subject.)

This Regional Safety Officer believes that maintenance personnel was negligent in not checking the fuel pump and pressure valve on engine Number 2 when the fuel pressure for that engine was reported high. Bleeding the line to the autosyn transmitter is not sufficient corrective action. The pump itself should have been checked and especially is this so when the fuel pressure continued to run high during the month. (See attached extracts from Form 41B.)

This Regional Safety Officer further believes that the fuel line could be enclosed in a flexible metal tube, thus brass fittings could be used at the joints. This would eliminate the hazard completely.

This accident should demonstrate the need for "bail out" drill. Had this crew been drilled in jumping from the airplane, had they had a definite procedure in mind, most of their lives could have been saved. Cool headedness and quick action come from training and discipline. In an emergency, previous drill becomes important. Reference to the crew statements will indicate how deficient this crew was in this respect.

It is the opinion of this Regional Safety Officer that the pilot could have landed his airplane. No attempt was made to put out the fire in engine Number 2. So far as the evidence shows, the fire extinguishers were not even pulled. No serious attempt was made to fly the airplane. The five or six minutes of three-engine operation prior to the failure of engine Number 2 would have been sufficient to start a let-down for the field had the pilot known his position. A landing could have been made. If the decision of the pilot had been to abandon the aircraft, altitude could have been held, the C 1 pilot could have been engaged and a successful jump accomplished by all. No definite plan of action ever occurred to the pilot; he became panicky and allowed the airplane to fly without control. Previous training in two and three-engine operation would have given this officer greater confidence and would have allowed him to handle the situation more intelligently. It cannot be expected that he would do the right thing under pressure when he had had no previous experience. Here again as in the case of parachute drill, it is a case of lack of training in emergency procedure.

26. RECOMMENDATIONS:

1. A list of men thoroughly trained in the checking of valves on the R3350 engine should be made. No others should be allowed then to do this work. Wright representatives at B-29 bases are ready and willing to teach how valves can be checked and worn valve guides found. Their services should be utilized in the compilation of the above-mentioned list.

2. The fuel line on the motor driven pump to the carburetor should be re-designed. The suggestion here is that it be enclosed in a flexible metal tube with brass fittings at each end.

3. Squadron Commanders and Directors of Training should personally check with their operations officers to see that each crew has received both instruction and drill in "bail out" of the B-29. They should also make spot checks of crews themselves to see if proper training and drill have been accomplished. It is not

enough to say that it is the airplane commander's responsibility; an inspection should be made to see that this responsibility has been discharged.

4. Further training must be given to B-29 pilots in two and three-engine operation.

27. ALLIED PAPERS ACCOMPANYING REPORT: 1. Pictures:
   a. "Wreckage was confined to a small area."
   b. "Tail snapped off and fell, indicating no forward momentum."
   c. "Army 578 struck the ground perpendicularly."
   d. Air views.
2. Notes on weather briefing.
3. Summary of Weather at Smoky Hill Army Air Field.
4. Local clearance.
5. Form 23.
6. Form "F".
7. Discrepancies noted on Form 41B, airplane B-29, Number 42-24578.
8. Tower contacts with Army 578.
9. Statement of tower operator.
10. Disassembly of engine Number 2.
11. Disassembly of engine Number 3.
12. Crew statements:
   a. Flight Engineer
   b. Navigator
   c. Bombardier
   d. Tail Gunner
   e. Instructor Radio Operator

28. ACCOMPLISHMENTS REGARDING RECOMMENDATIONS:

In compliance with recommendation Number 1, a valve check team was formed as outlined above.

To correct trouble referred to in recommendation Number 2, all aircraft were grounded for inspection of fuel lines.

This comprises the corrective action taken in the field.

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