SHE was coming in fast. There was a tenseness in the tower. October squashed heavy on the glass, meandering unsuspectingly to shocked dispersal in a rhythmic sweep of clear vision. The Ground Controller watched a shimmering screen holding in symbol the movement of the delta-winged Vulcan slicing blind and low in black cloud over London. She was coming in fast. Faster than any of the civil aircraft the Ground Controller knew-and she was coming in too high. Instinctively the speed of his spoken instructions quickened-80 words a minute; 126 words a minute—he had never had to direct a landing so rapidly. It was still not fast enough. She was still too high. He had to convey the information on his own screen. He had to collate it with information from an assistant. He increased the tempo to 146 words a minute. She was now 80 feet above the true glide path. He told her. He watched the height correction beginbut now she was yawing sideways. His mind and instructions switched from her height to her side to side deviation. It was a matter of seconds. Five seconds, four, three-she was correcting, two-but what of her height-one. A billowing uneven orb of orange and oil black flame erupted angrily through the rain.

The Vulcan, pride of the R.A.F. and symbol of British aero-engineering had ended a triumphal and record-making world flight in a cabbage patch, half a mile short of the runway of London Airport.

Where was the fault? Whose was the blame?

What evidence there is came to light at the inquest on the four men who died in her; in the quasi-official R.A.F. version of the accident given by Mr Nigel Birch to the House of Commons just before Christmas; and in the re-port in January of Dr Touch, electronics expert of the Ministry of Supply.

At the inquest, a surviving pilot told how the cockpit instruments showed the



## The Fate of the Vulcan

By A. ROTKOPF

Vulcan to have an altitude of 150 feet when she was, in fact, about to touch was the view of Mr Birch outlined in ground. A witness from the R.A.F. experimental station at Boscombe Down the Commons. Neither pilot nor ground controller had taken sufficient care about then explained that this is a variation the precise height of the Vulcan in known and normally allowed for by pilots. There is a "normal" error of 70 the final stages of its approach. The pilot, for his part, had left it fatally feet in an altimeter reading. This marlate to avoid landing if conditions were gin is almost doubled when the aircraft is near the ground. Variation may be too difficult. The ground controller had failed to warn him that he was flying dangerously low. This latter was the again increased by possible manufacturer's error up to a further 70 feet. immediate cause of the accident. All these are known and normal possibilities and pilots must expect and pro-

Dr Touch's report of his separate enquiry, made at the instigation of the Ministry of Transport, admits that there was little and often conflicting evidence. He strongly urges among the immediate causes, that the ground controller did

not warn the pilot that he had dropped too far in complying with the first height warning.

on the runway at London airport.

But it was not as simple as that. The controller was comparatively new. He had received his G.C.A. rating only late in August. Now in October, only two months later, he was called to monitor a military aircraft of advanced design -approaching at a speed and oscillation from the glide path greater than any of the civil aircraft he normally guided.

After his last warning about height he had only three to five seconds to give a new altitude correction in time for the pilot to apply it. During that time he was, in fact, concerned with side to side deviation.

While the immediate fault lay with the ground controller, Dr Touch does consider he can be altogether blamed for it. It seems, in fact, that some reproach attaches also to those who ordered the landing of such an advanced military aircraft at a civil airport—where its flight characteristics were not sufficiently known to the ground controllers.

The immediate fault, however, must be shared between the ground controller and the pilot. But it need not be exaggerated to suggest necessarily any real negligence on either part. These men had to compute and transmit a situation and translate it into actions within a set of circumstances highly complex and swiftly changing. They were operating at the very margin of human capacity—at the point where the speed and complexity of technical develop-ment meets the physical limits of human reaction.

Following the enquiries into this tragedy, a number of precautions have been suggested and some already implemented. It has been recommended that military aircraft of advanced design should not land normally at civil airports where controllers have not been specially trained to deal with them. Control systems must be streamlined to keep pace with the generally increasing approach speeds of all aircraft. Unnecessary words and information must be cut out. At present the Ground Controller depends on an assistant for some vital information. He should have all relevant data on the screen before him.

The loss of four young lives and the Vulcan has stressed the urgency of these recommendations. It was a hard

(Solution to No. 850)



## Clues Across

- 1. For this you may be examined, but certainly not treated as well! (7).
- 5. It is generally thought of as filthy, and could give rise to an ulcer (5).
- 8. He tears around in the middle of dining, and it is most discouraging, especially to the cook, perhaps (13).
- 9. A big change from 22 across (5). 10. Sums are a muddle for him, so would he say, "Ay, there's the rub!"?
- (7), 11. Turds out (6).
- 13. An absorbing part of one's tollet?
- 17. What every prospect does in the well-known hymn (7).
- 19. A majestic form of 20 down (5).

## CROSSWORD

Methodists probably don't agree (13).

This seemed to shift the blame away

from mechanical defect in the aircraft's

instruments, and to place it on the pilot and the ground controller. This

The drink for 7 down? (5). 23. On board, Hynes displays a lack of ease in company (7).

## Clues Down

- 1. Give free rein to a confused din over spilt glue (7).
- 2. He may take part in a close race, but he doesn't win (5).

vide for them

- 3. It makes the first woman abstain from exertion, but it certainly didn't have that effect on Sir Edmund Hillary (7).
- 4. Miserable little fish! (6).
- 5. This English city sounds as if it takes first place (5).
  6. An American loses
- his head and is put to rout in this war (7).
- 7. A composer composed of 9 across
- 12. It is made of beer for the most part, and most of it is under water (7).
- Describe as a nautical red light? (7). 15. Less tin (anag.) (7).

- 2).
  - 17. He is partly puppet and partly pilgrim, and partly my eye! (5).
  - 18. Sedate robes (5).
  - 20. If you upset 7 down would be do this at you? (5).

No. 851 (Constructed by R.W.H.)