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AVALANCHE CONTROL OPERATION

METHODS USED IN GLACIER NATIONAL PARK IN THE SELKIRK RANGE
TO PROTECT THE TRANS-CANADA HIGHWAY FROM AVALANCHES

Glacier National Park, British
Columbia, April, 1962

The Trans-Canada Highway, stretching from coast to
coast across Canada's 5,000 miles, will be officially opened this
fall. One of the most difficult sections to build because of the
snowslide protection required has been the new road through Glacier
National Park via Rogers Pass - chosen because it is the lowest and
shortest route through this part of the Selkirk Mountains and it
will shorten the road from Golden to Revelstoke, B.C., by 100 miles.

On other roads in mountain areas of heavy snowfall
where avalanches are common, it has been the practice to close them
to traffic in periods of greatest danger. However, this is not
desirable on the Trans-Canada Highway. So, special arrangements
have had to be made along this route lined by the lofty, rugged
peaks of the Selkirk Mountains rising from 10,000 to 11,000' above
sea level and where the snowfall is extremely heavy due to the mild
very humid prevailing westerly winds depositing moisture in the
form of snow. The average snowfall in the Park is 342" each
winter, but sometimes this goes as high as 680" (the winter of
1953-54). There are two avalanche periods each year -- the first
between early November and late February, and the second between
late March and mid-May when they are caused mainly by warm weather
and melting snow.

When consideration was given to using Rogers Pass
as the Trans-Canada Highway route, the Federal Department of Public
Works began in 1953 a study of the location of each avalanche site
and the conditions under which avalanches occur. In 1956, they
built the first avalanche observation station at Glacier, and sub-
sequently enlarged the programme with the co-operation of the
National Research Council to obtain the information required for the
supervision and design of the defence observation programme. Then
in 1959, the responsibilities for snow and weather observations
and for avalanche hazard evaluation and forecast were transferred
from these departments to the National Parks Branch of the Federal
Department of Northern Affairs and National Resources.

During this period, observatories have been built at
different altitudes for the specific purpose of obtaining average
high altitude meteorological and snowfall records, and observers

keep close watch with the aid of telescopes and other means for any indication of an avalanche over the Rogers Pass region. Last summer the Department of Northern Affairs built a new snow research station at a height of 6,500' -- the Mount Fidelity Research Station -- where Mr. N. C. Gardner, the officer in charge and his staff, check all incoming information on air temperature, precipitation, wind and snow cover, and men on skis obtain findings from recording instruments -- platform and storm stakes, etc., inserted into the snow at various locations. An avalanche "trigger zone" is a particular zone where prevailing winds accumulate the snow in steep depressions overburdening the slope and causing the snow to slide. Checking the resistance of these zones is highly dangerous work.

A snow laden slope with a past history of avalanche activity will, during a storm and for a varying time thereafter, present several degrees of instability. The only sure way to prove this instability is to attempt to release the avalanche by the use of explosives. In 1959, 60 and 61, the Artillery have been surveying for gun and target areas and shooting down avalanches in the Rogers Pass area. As a result of these trials, several recommendations have been made including one which resulted in the construction of permanent gun sites as part of the new highway, with each site commanding several avalanche paths.

When Mr. Gardner has declared an avalanche danger time, he informs the National Parks Superintendent, Mr. R. B. Styles, at Revelstoke, who alerts the Army that a shot will be required and puts the wheels in motion to stop all incoming traffic at both ends of Rogers Pass. The Army, stationed at the bottom of the valley in Rogers Pass Summit Maintenance Camp, ready their 105 Howitzer and equipment, and proceed to the area selected for the shot. Major General J. M. Rockingham, Commander of the Army's Western Command, was an observer on the shoot covered by our story. When the avalanche has been successfully shot down, the snow begins its gigantic spill down the mountain, gaining momentum as it sprays out over the cliffs. Then the maintenance crew moves in with snow plows, etc., to clear the road, after which traffic can be resumed.

In addition to the spectacular artillery shooting down of avalanches, other methods are used to control the heavy snow in the area as part of the permanent defence. The safest is the snowshed -- a new one, 1,500' long, was built last summer and more are being constructed. They are of precast concrete and are built over the road at points where the avalanche danger is most acute. Mounds, or "dragon's teeth", form part of the permanent defence. These are cone-shaped hills of earth, 12' to 25' high, built in series with their dimensions and pattern depending on the terrain and expected snow movement. They set up an obstacle in the path of an avalanche, and piles of snow gather around them which provide further protection. A total of 170 will be built at 6 different places in Glacier Park. Diverting dams, made of earth and ranging from 20' to 25' high with a top width of 10' and side slopes of 1' to 1½', are also used to change the direction of a slide away from the highway or to restrict its width so that a shorter snowshed will suffice in a danger area. Benches have, also, been constructed into the side of the mountains to catch and hold a slide -- some are 1,000' long and 150' wide, but these require more attention as they have to be cleared of snow periodically.

A warning system is being set up to operate day and night during the potential danger season when this section of the Trans-Canada Highway will be open for the first time for winter traffic in 1962.

Through years of planning and co-operation among the Federal Department of Public Works, the National Research Council, the Department of Northern Affairs and National Resources and the Army, the Trans-Canada Highway will become a safer route and will open up this beautiful section of Canada for the first time to motor traffic.



## Shot list

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1. LS view of snow covered mountain peaks above Rogers Pass taken from Mt. Fidelity
2. LS view of Copper Mountain from Mt. Fidelity
3. LS view of Illecillewaet Valley on Trans-Canada Highway (low lying clouds in valley)
4. LS snowcat arriving from maintenance camp
5. MS snowcat climbing hill to Mt. Fidelity Research Station
6. MS observor going out of Research Station on skis
7. MS observor on skis crossing horizon, valley and mountains below, camera pans up to reveal snowcapped mountains
8. MCS observor skiing past snow hole
9. MS observor skiing up to snow reading instrument
10. CU observor reading instruments
11. CU (interior) Mt. Fidelity Research Station assistant fore-caster checking instruments
12. CU same as above
13. CU control panel - avalanche warning signal flashing
14. MCU Mr. N. C. Gardner, officer in charge of Mt. Fidelity Research Station, working on plotting board
15. MCU Mr. Gardner picking up mike and starting to transmit information
16. CU Mr. R. B. Styles, Superintendent of National Park, at Revelstoke, in car receiving message from Mr. Gardner
17. MS Maintenance Foreman, Mr. Glen Critch, taking message from Mr. Styles at Rogers Pass Summit Maintenance Camp
18. LS gun crew and vehicles leaving maintenance camp
19. MLS Sign - Glacier National Park, Rogers Pass Maintenance Camp - with mountains in background
20. MS maintenance machinery at work, mountains in background
21. MS view of rugged mountain top
22. MCU two shot, discussing observations
23. MS gun being towed into permanent gun site stand
24. MCS men hauling gun into position
25. MCS men inspecting gun position
26. MS General J. M. Rockingham, of Western Command, and army officers approaching camera
27. MS men finding gun range
28. CS ditto
29. CS pan down to adjusting gun range
30. MCS loading gun

31. CS man giving signal to fire, mountains in background
32. MCS gun fires
33. MCS loading gun
34. CU General Rockingham looking through field glasses
35. MCS gun fires
36. LS snowcapped mountain, shell exploding, starting avalanche
37. MS avalanche gaining momentum as it sprays out over the mountain
38. MS ditto, pan down with avalanche
39. MS two shot, skiers pointing, mountains in background
40. MLS snow blower in action along main highway, with mountains in background
41. MS truck driving into snowplow spray
42. CS taken through windshield of car as spray covers windshield, and wipers start to clear it
43. LS pan down from snowcapped mountain to reveal "dragons teeth" at foot of mountain
44. CU dragons tooth, right to left pan to show skier passing through dragons teeth
45. IS as above
46. LS truck passing along highway in foreground, dragons teeth and mountain in background
47. MS taken from travelling motor car entering snowshed at Rogers Pass
48. MS travelling shot inside snowshed
49. MS truck emerging from end of snowshed and passing camera
50. IS two skiers approaching camera, downhill
51. MCS same as above
52. HAMS Mt. Fidelity Research Station
53. LS snowcapped mountains and cloud in valley.