O T T A W A July 3rd, 1941.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1041.

Kinking in Aircraft Target Towing Cable.

BUREAU OF MINES
DIVISION OF METALLIC MINERALS

ORE DRESSING AND
METALLURGICAL LABORATORIES

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

O T T A W A July 3rd, 1941.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1041.

Kinking in Aircraft Target Towing Cable.

Origin of Request:

In a letter dated June 10th, 1941, Group Captain A. L. Johnson, for the Chief of the Air Staff, Air Service, Department of National Defence, Ottawa, Ontario, described two cables which were being submitted for examination. Kinking had occurred in one cable. The other cable gave satisfactory service. An investigation (and report) was requested.

Description of Cables:

Figure 1.

Cables as Received.

Figure 2.

Figure 3.

First Stage of Kink.

Second Stage of Kink.

(Continued on next page)

(Description of Cables, cont'd) -

Both cables were of the 7-strand, 19-wire, lang-lay wound type. The wires in the satisfactory cable were 0.011 in. in diameter and the wires in the kinked cable were 0.009 in. in diameter. The satisfactory cable weighed approximately 0.0455 pound per foot with a 1-1/8 in. length of lay, and the kinked cable weighed 0.029 pound per foot with a 7/8 in. length of lay.

Chemical Analysis:

	Carbon, per cent	Manganese, per cent	Silicon, per cent	Phosphorus, per cent
Satisfactory cable	0.66	0.74	0.20	0.028
Kinked cable	0.69	0.59	0.28	0.023

Physical Tests:

Satisfactory cable broke at 3,200 pounds, (4 strands gave way).

Kinked cable broke at 2,150 pounds, (4 strands gave way).

Kinking Test:

A kink was made in each cable by clamping a loop between two hardwood blocks and applying a tensile load of 1,000 pounds. The blocks were removed and a load of 1,000 pounds applied again.

Figure 4.

Cables after kinking test.

(Continued on next page)

(Kinking Test, cont'd) -

The most severe kink was formed in the lighter cable. Some wires were broken in the light cable during this test. The heavy cable had no breakage.

Preforming:

A one-foot length of each cable was cut off. The heavy cable spread apart slightly. In the light cable the strands flew apart. This indicates that the light cable was not preformed and the heavy cable may have been preformed to a slight extent.

DISCUSSION:

Superficial examination has shown that these cables have about the same tensile strength per square inch, and about the same chemical analysis. The problem of kinking is more a mechanical than a metallurgical problem. No information is at hand on the nature of the service expected of these cables.

Vibration may be set up in the cable as the target is towed through the air. As a result, distribution of stress may not be uniform throughout all the wires of the cable. Some wires may slacken up, thus helping to form kinks.

Size of winding drum, shape of grooves, and speed of reeling and unreeling, all have some effect on the behaviour of the cable in service. Those responsible for the operation of the cable should see that these factors are considered.

Lang-lay cable is more subject to twisting when the load is released than is regular-lay rope. It is recommended that when lang-lay rope is used, both ends of the cable should be fixed.

(Continued on next page)

(Discussion, cont'd) -

The cable should not be piled up loosely or kinks will surely result.

The smaller cable will kink more easily than the larger one, due to its lower strength and smaller diameter.

Conclusions:

1. Kinks can be produced in either cable by careless handling. Light cable would naturally kink easier than heavier, stronger cable.

2. Since the cable weighing 0.0455 pound per foot (lang-lay, 7-strand, 19-wire) gave satisfactory results, it would seem advisable to specify this type of cable for future use.

3. More care in handling must be exercised if the light cable is to be used.

OOOOOOOOOOO
OOOOOO
OO

HHF:GB.