SLIDE-RULE WARFARE

By Colonel W. C. Hall

How to detect the built-in bias in curves and other seductive come-ons

SOME cynic has described a staff study as a devious path from an unwarranted assumption to a foregone conclusion. The staff study is apt to be accompanied by charts, since the statisticians, like Jane Russell and Marilyn Monroe, have discovered that curves influence people.

Both the commander and the staff officer must have an understanding of statistics and charts in order to arrive at the correct solution based on a proper analysis of the data prescribed.

How is Recruiting?

Let us suppose that the recruiting record in a purely hypothetical area is as follows: second quarter (fiscal year) average, 1,040; January 1,030; February 1,060; March 1,075. Is this a good or bad record?

The top graph on page 50 indicates that it is bad. It appears to be practically at a standstill. And if we add some information, such as the fact that we spent more money in the third quarter than in the second, we indicate a definitely unfavorable situation.

Suppose, however, that we truncate, or cut off, the bottom of our chart at 1,000, as in the bottom graph Now the curve looks different. Now if we explain that January is always a bad month because of weather, and indicate an improvement over the third quarter of the previous fiscal year, we have an optimistic report.

How is recruiting? You are the commander. You must decide, based not only on the curves but on an unbiased evaluation of the available data. Recruiting may be good but all considerations should lead you to that conclusion.

What Will Steel Do?

Financial pages dote on charts showing steel production and so let's do the same. Based on the record, what are our estimates for the future? The chart at the top on page 51 indicates clearly that steel production was lower in 1954 than at any time since 1949. It also

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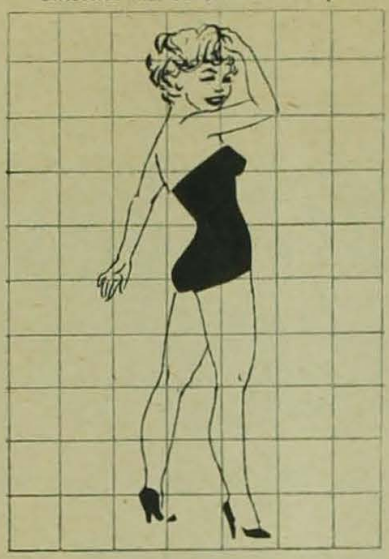
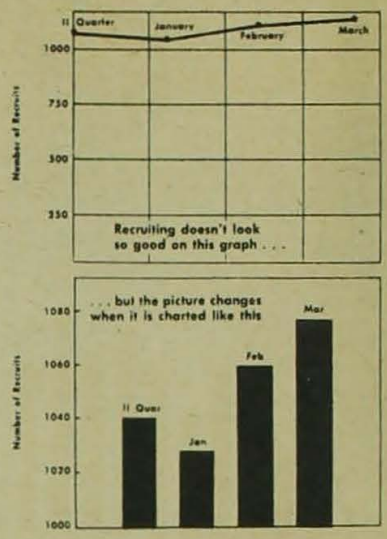


How's Recruiting in Area A?



shows wide annual fluctuations. Based on this curve alone, would you estimate 1955 production above 95 million tons?

On the other hand, the chart under it shows that there has been a steady increase during the last half of 1954. If this keeps up, 1955 might be a record year exceeding 1953's 111 million tons.

Which chart gives the better indication? Do we accept the long-range or the short-range trend? Actually, in 1955, steel production rode along with the boom to a record 115 million tons.

Other Tricks with Graphs

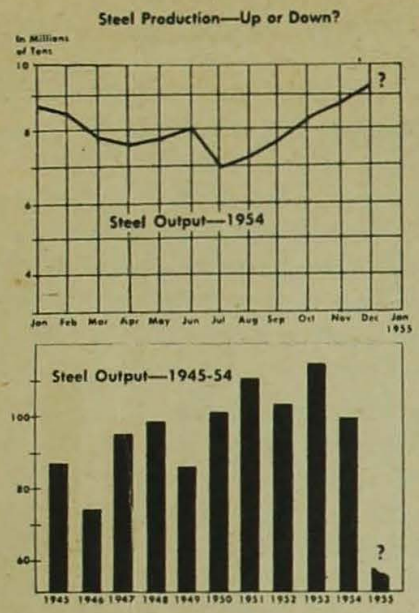
In the use of bar charts, we sometimes find bars of different thicknesses. If the data are represented by the length of the bar alone, then obviously the heavier bars give an exaggerated appearance. If, on the other hand, the data are represented by the area of the bars, the tendency is to minimize differences.

A change in scale may be employed. To illustrate, in the first chart on recruiting a quarter is compared with individual months. The average would be better shown as a bar three times as wide as the month bars. (The individual figures for October, November and December would be still better.)

The use of logarithmic or semi-logarithmic scales will flatten a curve 100 or more times. The numerals 1, 2, 3 become 1, 10, 100 if the scales are transformed to log scales.

Projections into the Future

This is the most dangerous kind of chart or graph. It is possible and frequently necessary to estimate requirements or production, but all available factors must be considered. The tendency of the chart is to oversimplify acts to inhibit full weighing of all elements. The charts on steel production show this. They show nothing but trends according to past production scheduled to go into operation during 1955, backlogs of orders going into 1955, and all the facts we knew about domestic and world trade, finance, and other facets of business know at the time.



Use of Tables

Statistics in tabular form are not, generally, so prone to give exaggerated impressions as graphs. There is, in addition, less tendency to oversimplify. But even in this field data must be examined with caution.

One common trick is the use of different average figures. The "mean" of 1, 2, 3, 4 and 10 is obtained by adding the numbers and dividing by their number: 20/5 — 4. The "median," on the other hand, is that number in the middle of the list arranged in order of magnitude—that is, 3. Sometimes, the average is determined from the extreme elements only: 11/2 — 5½.

The average temperature of two cities might be 78 degrees F. in each case, but while Honolulu has a range of from 65 to 88 F., the other (I won't name it; I may be stationed there some day) might have a variation of from minus 10 to 110 F. Which has the better climate? Without considering range, an average may be meaningless.

Percentage reductions

Recently I ran into a new statistical weapon—the integer. While I was a G4, a representative of the local comptroller's office asked me to concur in the reductions in strength indicated in the table below, to meet an overall four per cent cut.

Office	Officers	4% Cut	Reduction in Officer Strength
G1	11	0.44	0
AG	51	2.08	2
G2	30	1.20	1
G3	36	1.44	1
G4	16	0.64	1
Engr	19	0.76	1
Ord	15	0.60	1
QM	13	0.52	1
Signal	10	0.40	0
Trans	13	0.52	1
	225		9

It appeared to me that G3, for example, with 36 officers, could afford to lose two officers with less difficulty than any of the smaller sections could lose one.

When I was unable to make headway with this argument, I proposed that G4 as the coordinating section for the technical services, group these sections together, take the required cut and apply it where it would hurt the least. I was able to get away with this argument, with the result that, taking 4 per cent of the total of 86, we came up with a reduction of 3.44, or 3 instead of 5.

We've had fractional horses in the Army, but never fractional men. Since a fraction, or rather, percentage, of 0.51 equals 1 when we are confined to integers, and 1.49 also equals 1, a lot of maneuvering is possible in this field. For example,

in our table, three successive cuts of 4 per cent would reduce G3 and G4, each by 3, whereas a single reduction of 12 per cent would hit G3 for 4 and G4 for only 2. Where you cut may depend on how you cut.

Is It Proper Propaganda?

A good graph or chart is a desirable instrument for illustrating facts. People are more readily influenced by charts than by words.

The commander and the responsible staff officer must be assured of the validity of his graphics. The data must be correct. They should neither omit an element nor smother one factor with another. Tanks, for example, cost so much more than the other items of equipment in an armored division, that the costs of equipment these divisions will vary almost as the costs (if numbers are equal) of the tanks.

If we combined the costs of maintaining light planes and helicopters, the cost would lie between the two and likely be meaningless.

The interpretation of the data must be objective, and be made by someone technically qualified to understand the operation being charted.

The Skeptical Attitude

And what else can the commander do? In addition to analyses by his staff, the commander should maintain a skeptical attitude and not hesitate to ask questions. Even on technical matters, he should insist on common-sense answers.

Once when General Patton and members of his staff were inspecting the construction of a bridge over the Rhine River, the engineer in charge explained that he was saving several days' construction time by using the abutments of a blown bridge and setting vertical posts for his piers through holes blown in the old bridge floor which had dropped as a unit. It was explained that this procedure was feasible since the bottom was firm.

"How in hell do you know that?" was Patton's question. "There must be a lot of rubble down there."

A considerable amount of probing indicated a hard bottom, but the General was right: one pier settled enough to cause extensive worry and repair.

One spring following a football season in which Michigan had beaten Ohio State 7-6 for the Big Ten title, the Ohio State coach invited Will Rogers to watch practice. The entire squad was engaged in practicing kicking extra points.

Said Will, "Don't you think that you should have someone practicing touchdowns?"

And speaking of specialists, it was a wise man who said, "Experts should always be on tap, never on top."

(Reprinted from the ARMY magazine)

Colonel William C. Hall, Corps of Engineers, has been a contributor to ARMY and its predecessors for many years. His "A Medal for Horatius" (January 1955) has established its place as a classic of military humor. No other article from this magazine has been more widely reproduced—by civilian and service publications, sometimes with and sometimes without credit or permission. Colonel Hall is a 1931 graduate of the Military Academy who transferred from the Infantry to the Engineers in 1936. He has just finished his year at the National War College.