Draw a stock and flow diagram

This article reports on falling morale in the British Armed Forces and the effect it is having on the number of soldiers leaving the military.

Your task was to identify the stocks and then draw the stocks and flow diagram. There are three steps to drawing a stock and flow diagram:

1. Identify the key <u>stocks</u> in the system;
2. Identify the <u>flows</u> that modify the levels of the stocks;
3. Add the remaining variables and relationships including any feedback loops.

Step 1: Identify the key stocks. Let's work through the article and look for accumulations.

A quarter of those serving in the UK's armed forces want to quit, a Ministry of Defence survey (MoD) suggests.

The rate of personnel planning to leave, or who have given their notice, increased from 16% in 2011 to 25% now.

Those planning to stay in the service for as long as they could also fell from 41% in 2011 to 34% now.

However, the survey of 11,877 personnel also found there had been an increase in morale, with 45% rating their morale as high, compared with 41% in 2014.

'Bad to worse'

The 2015 Armed Forces Continuous Attitude Survey was responded to between October 2014 and February 2015.

The number of those who expressed dissatisfaction with service life rose five percentage points since last year to 32%.

If we froze time, what could we still measure in this article?

We could still measure the number of soldiers. This stock is mentioned in the first two paragraphs.

We could also still measure the level of morale or dissatisfaction. The fourth, fifth and sixth paragraph refer to these intangible accumulations of an attitude. We will group them together and call them "morale". Morale is a qualitative variable that was measured by survey (2015 Armed Forces Continuous Attitude Survey). Soldiers were asked to rate their level of morale and that of their unit and the Service in general on a scale of 0 to 100%. We can draw these stocks as boxes.

Step 2: Identify the flows that modify the levels of the stocks. Flows are measured in the same units as a stock and expressed as a number of units over time. For example: we can only fill a bathtub of water with a flow of water over time.
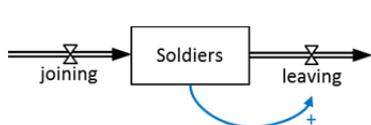
The stock of soldiers is increased by the number of new soldiers joining the Armed Forces over a time period (ex. per year) and is decreased by the number of soldiers leaving per time period.
<u>Bonus points</u>: The number of soldiers leaving most likely varies with the size of the stock. We can add a feedback loop between the stock and the flow to show this. This was not explicitly mentioned in the article.
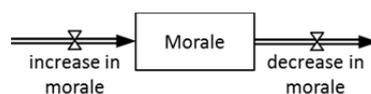
Morale is measured in percentage points. The inflows and outflows into this stock must be in percentage points per unit of time.

Step 3: Add the remaining variables and relationships including any feedback loops. The article notes the relationship between the level of morale and the number of soldiers leaving the Armed Forces in the tenth paragraph. We can add this link to our diagram.

In paragraph eleven and twelve the article mentions actions that are being taken that could increase morale such as improvements to service life and recognition of contribution and sacrifice.

In the eighth paragraph the article mentions budget cut which may have a negative effect on morale and also decrease the number of soldiers through forced redundancies. We can show this as a second outflow from the soldiers stock.
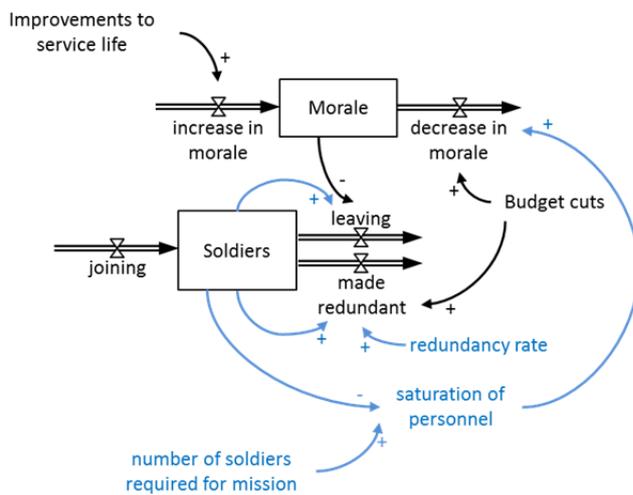
Bonus points: (1) As the number of soldiers falls, remaining personnel are used to carry out the same amount of work. This increases the saturation of personnel (ex. a feeling of being overworked) and may positively affect the decrease in morale. This part of the structure (shown in blue in our model) was not explicitly reported but is a logical extension to our model.

(2) The number of soldiers leaving and the number made redundant most probably vary with the size of the stock. For example, the government may decide to lower Armed Forces personnel by 5%. If this was the case the number of soldiers being made redundant would have two causes: the population of soldiers and a redundancy rate. We can add the variable "redundancy rate" and feedback loops to our model.

This is a suggested solution. It is ok if you named your variables differently, identified more or fewer other relationships or didn't pick up any bonus points.

The goal of this exercise was to practice identifying stocks and their flows and then adding auxiliary variables and any feedback loops to the model. We can also see how two stocks – morale and the population of soldiers – are central to causality in this situation.