NOTE: In answering the following question, do not copy and paste text from the article. Use your own words.

1. (a) There are three assembly lines. The first is a moving line, on which the majority of the planes are assembled. The second assembly line is used whenever the space on the first line is not sufficient. While the two lines assemble commercial aircraft, the third line is used for special configurations, such as military planes and custom business aircraft. The main objective in adopting a lean manufacturing strategy is to reduce the process flow time for assembly, particularly on the first line.

(b) The actions taken include, but are not limited to the following:

- Reduction of in process assemblies and consolidation of assembly positions, allowing for less in-process inventory and reduced assembly times
- Reduction of work-in-process inventory from 30 to 11 days, which also reduces inefficient usage of space
- Just-in-time deliveries from the supplier, eliminating the need to store inventories of fuselage
- Just-in-time completion of various subassemblies, which eliminates the need to transport from another site, also reducing assembly times
- Moving of engine build-up to a compact space in the assembly building to reduce the need to transport and use large fixtures
- Pre-assembly of components into “plug-and-play” modules to reduce the total assembly flow time
- Color-coding for quick identification of containers, fixtures, etc. which reduces errors due to misidentification

(c) Currently, the sequencing of models and orders on the first two lines is irregular. Therefore, each plane undergoes assembly as separate projects. The irregularities in the sequences result in constantly changing requirements for modules, parts, tooling, and skills. This also clogs the upstream flow. In order to overcome these problems, the author proposes organizing Lines 1 and 2 into separate value streams: whereas Line 1 assembles high-demand configurations, Line 2 assembles more customized planes. Furthermore, the sequencing on Line 1 is made based on product commonalities and scheduled accordingly to prevent changes in assembly needs due to irregular sequences.

(d) The advantages of the system proposed by the author include, but are not limited to the following:

- Simpler operations, reduced inventories and related costs, more regular upstream operations
- More regular deliveries to customers
- Reduced need for rapid-response teams
- More routine kitting operations, elimination of the need for pick lists, reduction in the direct and overhead costs of kitting
- Reduction in the overall lead time

(e) The company is currently planning to consolidate Line 2 into Line 1. After the lean manufacturing activities are adopted, such a move will increase the average lead times, and therefore, related costs. Furthermore, the number of planes in assembly will increase, which will cancel out the gains from lean manufacturing. The risk of disruptions will also increase.