AIRPLANE EXERCISE

A Teambuilding Activity

Developed by:

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AIRPLANE EXERCISE

Summary

This is an exercise designed to illustrate to participants the difference between individual effort and team effort. During this exercise, participants will become a paper airplane company. Participants are to be given a paper airplane design or model and told to strictly follow a traditional assembly system in which they work independently for a period of time to produce as many planes as possible. Next, participants are asked to work as a team with a new system and try the exercise again. The quality and productivity of both systems are measured and compared illustrating the advantages of teamwork.

Estimated time for completion of exercise: 1 hour, 30 minutes

Number of participants needed: 8 minimum, 12-16 recommended

Materials needed

- 8 ½ x 11 paper
- Pencils
- (3) Scissors
- (3) Rulers
- (3) Staplers
- (3) Magic Markers
- (2) Flip Charts
- Masking Tape
- Stop Watch
- Pattern templates (cut from poster board or shirt cardboard)

Meeting room should be at least 20” x 30” feet in size and contain several conference size tables

Glossary of Terms

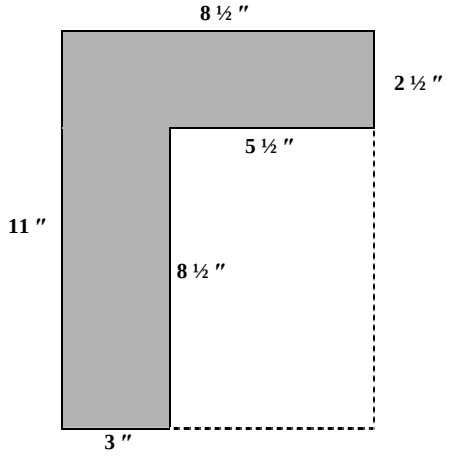
Balance	To adjust equally the time it takes to complete each operation
Throughput Time	The time it takes for a product to travel through all of its operations (i.e. from the time material is cut until plane is flown down test range)
Bottleneck	The operation that takes the longest amount of time to complete
Work-in-process	Work that is being completed, or work that is waiting to go to the next operation (Work in processes represents money - $300 per unfinished plane)

Facilitators Instructions

Before Participants Arrive

1) Set up training room for *traditional* system. Arrange tables to insure a relatively smooth assembly processes for the planes. A 10 ft space will be needed as a *test range* to fly planes. Set up flip charts side by side so they can be seen by all participants.

2) Create *pattern templates* from the specifications below. Poster board or cardboard can be used. Pattern templates are made so they can be superimposed onto 8 ½ x 11 sheet of paper from which *material* for paper airplane can be outlined and cut into proper specifications (8 ½ x 5 ½ sheets).



Note: *The exercise can be done with one template but 2 are recommended to have on hand for larger groups with more than one Pattern Maker.*

3) Create a model plane that conforms to quality specifications. There are many ways to create a paper airplane - pick a relatively straight-forward design that can be easily duplicated. The folds are unimportant as long as it meets the following specifications:

Model Specifications

- Use 5 ½ x 8 ½ pieces of paper
- Make tight, neat folds
- A staple should be inserted in the planes structure to insure that it stays together. The staple must be placed straight and parallel to the keel
- The wingspan should be between 3 – 5 inches
- An insignia chosen by the facilitator should be painted (using magic marker) onto the top surface of each wing. Insignia should read left-to right when viewed from the top of the folded plane.
- The plane must fly 10 feet down a measured course

Once model is created, be prepared to explain its exact specifications and show participants exactly how to make it.

Before Session Starts

4) Assign the team members to specific jobs. One person each should be assigned to the following positions:

Supervisor	Oversees the operation making sure things get done but does not perform any operation personally.
Material Handler	Responsible for moving ALL materials from one place to another.
Quality Control Inspector	Check that each plane is made according to specifications upon completion. Records results on flipchart.
Test Pilot	Responsible for test flying each plane (throws planes in the air along specified 10 ft area).

The remaining participants should be divided as evenly as possible among these positions:

Pattern Makers	Outline patterns onto 8 ½ x 11" sheets of paper using pattern template.
Cutters	Cut patterns outlined by Pattern Makers to create 5 ½ x 8 ½ material.
Folder/Assemblers	Fold 5 ½ x 8 ½ sheets according to facilitator's specifications then place staple accordingly.
Painters	Use magic marker to put insignia on each wing according to facilitator's specifications.

5) Place participants in stations according to their operations: *Pattern Making, Cutting, Folding/Stapling, Painting, and Quality Control*. However, deliberately put enough space between stations that it is more difficult to transport materials from one operation to the next.

6) Train all operators on how to do each job and explain the rules of the *Traditional System*:

- Do only your job. Do not help others do their work.

- Work at each station must be done in batches of 12. All 12 items must be completed before sending them to the next station and before starting on the next batch.

- The Material handler is the ONLY person allowed to move material from one station to another or bring supplies to any of the stations. The material handler CANNOT help do any other work.

- Participants may only use the tools/supplies which the facilitator gives them to use.

The QC Inspector is responsible for the reviewing each plane upon its completion. Each aspect of its construction is addressed:

- Is the plane correctly painted?

- Has the plane been folded correctly?

- Is the staple put in correctly and properly aligned?

- Does the wingspan measure to the specified length of the facilitator's model?

- Does the plane fly 10 ft?

Planes that meet all of the above criteria are considered "1st Quality Planes" all others are considered "Off Quality Planes." The QC Inspector is responsible for recording the number of 1st quality and off quality planes on one of the flip chart pages. Off-Quality planes are recorded according to their specific defects. (REFER TO ATTACHMENT I for specific instructions – model should be drawn on flipchart prior to beginning of exercise)

PLANES ARE CONSIDERED WORK-IN-PROCESS UNTIL QUALITY CONTROL INSPECTION IS COMPLETED. Tell participants that they can send off-quality planes back to specific stations to be repaired (carried only by the material handler) but they become *Work-in-Process* once again.

7) Run the exercise for 15 minutes or until the first plane is test flown WHICHEVER IS LONGER. Participants are told they only have fifteen minutes but allow them to at least test one plane under the traditional system.

8) During the exercise take a measurement of *throughput time* by following one plane through all of its operations (from when the pattern is drawn, through the end of the Quality Control Inspection).

9) Once 15 minutes have elapsed – stop the exercise. Tell participants not to move or clean-up anything (products or material).

10) Make the following calculations and observations:

- How many completed airplanes (including 1st quality and off-quality planes)?
- Calculate the defect ratio: See ATTACHMENT I
- What was the *throughput time?*
- How much material was wasted in this exercise?
- How many repairs were necessary due to problems in the painting and stapling operations?
- Measure work-in-process. Count how many incomplete planes in various stages and operations are lying around the room. This includes drawn patterns, partially folded, painted, & stapled planes, and any completed planes that have not yet gone through the QC Inspection. Off quality planes that have completed inspection and have NOT been sent back for repairs are not considered work-in-process.
- Calculate whether the team made any profits using the *Traditional System.* See ATTACHMENT II. This model should be drawn on flipchart prior to each exercise so that it can be filled in quickly.

11) Discussion: Ask team members what they didn't like about the system. Make a list of all problems that occurred while using the *Traditional System.* Be sure all issues in "step 10" are addressed in this discussion as well as *bottlenecks, balance,* and any other quality items not easily seen.

12) Announce that they are going to take a "20 minute break" (This is really a planning session). Ask them, while their on break to think about how they could rearrange this system in order for it of work better (one person needs to write down groups ideas). Let the group redesign the system as a team. They are allowed to use any of the supplies during the break to experiment on a new system.

Ask the Team to consider the following questions:

- Do you really need a Supervisor or Material Handler? If not what can you do with these people? We don't want to lay anyone off? (let the team figure out that they should retrain these people on more needed positions).
- Do you need to work in batches of 12?
- How can you cut down on waste?
- How can you better balance the operations?

- Do operations need to be spaced so far apart?
- Do they need additional supplies?

13) Upon completion of the "break" allow the team to set up the room stations and materials any way they wish to.

14) Run the redesigned *Team System* for 15 minutes. Tell the team to not let their work-in-process build up too much at any operation during the exercise. (If they can't get the airplanes completed, the work-in-process left over will just add to their costs.)

15) Time throughput time again.

16) Stop the exercise at the end of 15 minutes. Tell them not to clean up or move anything.

17) Repeat calculations and observations in step 10.

18) Make comparisons of the profits made using the *Traditional System* vs. the *Team System.* Which system proved more profitable for the team?

19) Discussion: Make a list on the flip chart of the things which the team liked about the redesigned Team System. Consider the following aspects: throughput time, number of repairs, quality problems, production results, defect ratio, and profits.

Also consider why the Team System is better fundamentally:

- Every team member had input into how the team did things giving them a feeling of **ownership**.
- The **combined expertise** of many competent people created a better more efficient system.
- Team members attained their goals through **cooperation** and a **shared vision**.
- Team Members were proactive to **solve problems** and **adapt**, seeking better ways of doing things.
- Team members had to **trust** and **support** one another, relying on one another to do their part, and jumping in when someone needed help.

At the end of this exercise participants should have a clear picture why working as a team can be far superior to working independently. Through teamwork companies can be more profitable, more efficient, and more productive while producing a higher quality product and giving employees more opportunities to get involved in the process.

For more information on Teamwork or help facilitating this exercise, please contact.

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ATTACHMENT I

Example

Quality Control Results

Traditional System

1st Quality Planes: 𝍸 𝍸 ||

Off Quality Planes

Wingspan defects: 𝍸 |||

Painting Defects: |||

Bad Folding: 𝍸 |||

Staple Defect: 𝍸 ||

Doesn't Fly: ||

Directions:

1. Draw the above on the flipchart for the QC Inspector. QC inspector keeps track of total 1st quality planes vs. off-quality planes by making a tally mark beside the appropriate condition. In the case of planes with multiple defects, only the first defect encountered should be recorded.

2. A separate *Quality Control Results* sheet should be created for the *Traditional vs. Team* results.

3. Calculate the *defect rate* for each system by dividing the number of off-quality planes by the *total* number of planes produced.

$$\frac{\text{\# of "Off-Quality" Planes}}{\text{Total \# of finished planes}} = \text{Defect Rate}$$

ATTACHMENT II

Profit Calculations

SALES	TRADITIONAL	TEAM
# of 1st Quality Airplanes x $1000 =	$_____	$_____
# of Off-Quality Airplanes x $500=	$_____	$_____
GROSS PROFIT	$_____	$_____
LESS COST OF MATERIALS		
# Of Finished Airplanes (1st Quality and Off Quality) x $500 =	$_____	$_____
# of Work-In-Process x $300 =	$_____	$_____
Waste Produced (10% of sale price) # x $50 =	$_____	$_____
NET PROFIT	$_____	$_____

Directions:

1. Draw the above on the flip chart to calculate profit.

2. Subtract cost of materials from "Gross Profit" to yield "Net Profit" for both systems. Waste produced is paper and materials left over from a plane at any stage of completion. **Waste = # of completed airplanes + # of work-in-process x $50**. NOTE: During the Team system there may be no waste if paper is cut in half rather than using the pattern – Teams should figure this out on their own!)

3. Compare profitability of using the Team system vs. the Traditional System.