Compensation, Training, and Assembly Facilities
Explanations – Cause-Effect Relationships – Suggestions and Tips

The decision entries for AC cameras and UAV drones on this page are important because of their impacts on Product Assembly Team (PAT) productivity (the number of cameras or drones a PAT can assemble per year), total labor costs and labor costs per unit sold, total assembly costs and per unit assembly costs, and, to a lesser extent, P/Q ratings.

Your first objective for this decision page should be to manage the assembly of cameras/drones in a very cost-effective manner—this means searching out a decision-entry combination that produces the lowest total labor cost per camera/drone assembled.

Your second objective is to provide for sufficient workstation space and installed workstations to be able to assemble the cameras/drones needed to fill projected buyer orders.

At some juncture, you will need to consider whether to shift to robot-assisted assembly of cameras and/or drones.

Each time you make a new entry in a decision box on this page, an assortment of on-screen calculations will instantly show the projected effects on the productivity of camera/drone PATs and the labor-related costs of assembling cameras/drones. For the first couple of years, you'll need to spend a bit of time absorbing all the data information on the page as you evaluate the relative merits of one decision entry versus another. As is the case with all the decision pages, the on-screen calculations are there to provide instant feedback on the projected outcomes of alternative decision entries and to facilitate your search for the decision entry combination offering the best projected outcomes.

Recommendation: Experiment with a number of “trial” or “what-if” entries to search for a combination of decision entries that lowers the labor costs per camera/drone assembled and, ideally, results in unit labor costs below the all-company average (you will find comparisons of your company’s unit labor costs for assembling cameras/drone to the industry-low, industry-average, and industry-high on pages 6 and 7 of each issue of the Camera & Drone Journal).

Use the links below to quickly access the topic on which you want explanations, guidance, and suggestions.

- Compensation and Training Decisions
- PAT Productivity
- Best Practice and Productivity Improvement Budget
- Additional Space for Workstations and Installing New Workstations
- Workforce Size Is Managed Automatically
- The Robotics Upgrade Option
- Capital Expenditures for Cameras and Drones

Compensation and Training Decisions

The top section of this page contains 4 decision entry boxes for compensating workers engaged in assembling action cameras and 4 decision entry boxes for compensating workers engaged in assembling drones. The compensation decisions are the same for both types of workers:

1. How much to raise/lower the base pay of PAT members—The maximum percentage increase in any one year is 10% and the maximum percentage cut in any one year is 15%. As might be expected, base pay reductions act to reduce PAT productivity. Small pay cuts do not entail a “big”
drop in productivity but cuts of 6%-15% will have a major negative impact. Annual increases in base pay of 2% or more lead to higher levels of productivity, chiefly because higher annual base wages help attract and retain workers with better skills and work habits and because higher base wages make workers feel better about their jobs and enable higher standards of living for them and their families.

2. **Whether and by how much to change the assembly quality incentive payment per unit**—The incentive payment is divided equally among all PAT members because all PAT members are involved in both assembling and testing cameras/drones. Camera/drone PATs have responsibility for fully testing the functioning of each AC camera/UAV drone assembled and correcting any performance problems, including replacing malfunctioning parts and components—the costs of replacing defective or malfunctioning parts/components are borne by suppliers.

Prior management instituted the practice of paying each PAT an assembly quality incentive for each camera/drone assembled and tested, the thesis being that such incentives spurred PAT members to propose ways to cut assembly and testing times while still accurately assembling and thoroughly testing each camera or drone after assembly. The practice of paying assembly quality incentives was continued by prior management because PAT members in the camera/drone assembly facilities took pride in coming up with better and more efficient assembly/testing procedures that helped reduce warranty claims and improve PAT productivity. Currently, the incentive payments are $1.60 per camera assembled and $3.20 per drone assembled; these payments are divided equally among all PAT members.

*It is up to you to determine whether to continue paying assembly quality incentives and whether to raise/lower the amount per unit.*

3. **Whether and how much to change the year-end bonus for perfect attendance**—Absenteeism on the part of PAT members has a negative impact on the functioning and performance of the remaining team members. When team members fail to show up for work as scheduled, a team’s assembly procedures are disrupted; either substitutes must be assigned to fill-in for the person(s) absent or else the team must try to proceed with assembling cameras/drones as best it can. To discourage absenteeism, prior management instituted the practice of paying a $800 year-end bonus to each PAT member with a record of perfect attendance (defined as working 2000 hours per year—50 weeks at 40 hours per week, with 2 weeks off for holidays and personal leave); missing as much as ½ day during the standard 2000-hour work year constituted disqualification for the bonus. Prior management believed the attendance bonus was successful in keeping absenteeism at a tolerable minimum, thereby enabling most PATs to operate at full-strength and assemble at least a reasonable number of cameras/drones each shift.

*Your management team has the authority to discontinue the practice of paying a bonus for perfect attendance or to continue the program, raising or lowering the size of the bonus periodically as you see fit. It is up to company managers to determine whether diverting the $800 bonus per PAT member to other types of compensation (such as bigger incentives or higher base pay or bigger fringe benefits) could lead to even better PAT productivity.*

4. **Whether and by how much to change company fringe benefits**—PAT members and other company personnel view a generous company-paid fringe benefits package (health insurance, disability insurance, term life insurance, and retirement plans) as an important element of a “good job” because the components of fringe benefit packages add to the overall well-being of them and their families.

The policy of prior management was to have identical compensation packages for workers assembling cameras and workers assembling drones. However, *your company’s management team has full discretion to have different compensation packages for the members of camera PATs and the members of drone PATs.* However, pronounced differences between the compensation package for camera PATs and the compensation package for drone PATs can generate unrest and dissatisfaction among the group of PATs receiving lower compensation.
The four compensation decisions relating to base wages, assembly quality incentives, attendance bonuses, and fringe benefit packages are important because a PAT member’s total compensation, not including overtime pay, impacts PAT productivity (the number of cameras/drones each PAT assembles each year) and (2) labor costs per camera/drone assembled.

**Back to top**

**PAT Productivity**

The productivity of each camera/drone PAT is influenced by 8 factors (5 of which are compensation-related):

1. **The annual base wage**

2. **The assembly quality incentive per camera/drone assembled**—You can easily track the effect of higher assembly quality incentives on both PAT productivity and labor costs per camera assembled by observing the changes that occur when a larger assembly quality incentive is entered. So long as a higher incentive payment results in lower labor costs per camera/drone assembled, it makes good economic sense to pay PATs the higher incentive.

3. **The annual bonus for perfect attendance**

4. **The fringe benefits package**

5. **The total compensation package**—not including overtime pay, of camera/drone PAT members relative to the industry average (or all-company average) compensation levels.

6. **Annually spending on training and best practices**—Apart from compensation, the productivity of PATs is affected by the effort the company exerts to train PAT members in the best assembly practices and to make continuous improvements in assembly methods, post-assembly testing of cameras/drones, and ways to reduce warranty claims. The amount spent on training also is one of the factors affecting a company's P/Q rating.

7. **Cumulative spending on product R&D**—A portion of the amount the company spends for product R&D is always devoted to designing the company's cameras/drones in a manner that reduces the amount of time it takes PATs to assemble and thoroughly test each camera/drone assembled.

8. **The number of models assembled**—Increasing the number of models in a given year will reduce PAT productivity, due to lower PAT proficiency in assembling more models and increased model change-over time. Reducing the number of models boosts productivity because PATs have fewer assembly procedures to master and less model change-over time.

In Year 5, camera PAT productivity was 3,000 units and drone PAT productivity was 1,500 units annually. There is reason to believe that over the next several years the productivity of camera PATs and drone PATs can be increased substantially if company managers aggressively pursue productivity gains. PATs assembling cameras have roughly double the productivity of PATs assembling drones because (1) drone PATs typically have to make changes in the cameras used in the company's drone models, (2) the steps required in drone assembly are more complex and time-consuming, and (3) it takes drone PATs more time to inspect and flight test each drone they have assembled than it takes for camera PATs to inspect and test the cameras they have just finished assembling.

As you enter decisions for base pay, assembly quality incentives, attendance bonuses, and fringe benefits, there are on-screen projections showing the impacts on (1) PAT productivity (see the last line in the top section of the page) and (2) the various components of labor costs per camera assembled (see the section labeled “Unit Assembly and Labor Costs”). You should **try out different values for the base wage percentage, assembly quality incentive, attendance bonus, and fringe benefits, searching for a compensation package and PAT productivity combination which results in comparatively low labor costs per unit**
assembled relative to those of rival companies. It is perfectly acceptable to decrease some compensation components and increase others, or to make no changes in compensation.

Important: It is wise to reconsider/avoid compensation increases that boost PAT productivity but raise labor costs per camera/drone assembled—the optimal outcome is PAT productivity increases that lower labor costs per camera/drone assembled.

You will see information on the page showing the extent to which your company's compensation package is above/below the prior-year industry average; you can use this information to gauge the competitiveness of your company's compensation package and signal whether you need to boost one or more compensation components to boost PAT productivity levels enough to lower labor costs per camera/drone assembled.

Again, bear in mind that putting together a compensation package to drive PAT productivity up to progressively higher levels over time in and of itself is not an applause-winning achievement. Rather, the most businesslike approach to workforce compensation is to achieve PAT productivity levels that result in lower labor costs per camera/drone assembled as compared to rivals and that translates into a cost-based competitive edge.

Best Practice and Productivity Improvement Budget

The productivity of PATs is enhanced by training PAT members in better assembly techniques, post-assembly product testing, ways to reduce warranty claims, and overall productivity improvement. You have the authority to raise/lower annual spending per PAT for such training. While spending greater amounts per PAT boosts productivity, the benefits from greater annual training expenditures per PAT are subject to diminishing marginal returns (that is, the benefits become smaller and smaller, eventually reaching a point where the added costs outweigh the added benefits). A company can always reduce annual training expenditures per PAT without losing the previous productivity gains.

Suggestion: Experiment with entering different amounts for annual training expenditures per camera/drone PAT and observe the resulting changes in PAT productivity and overall labor costs per camera/drone assembled. This will enable you to identify the "optimal" amount to spend on PAT training. Be aware that this amount could change from one decision round to the next.

Additional Space for Workstations and Installing New Workstations

Your company will in all likelihood need to expand both the camera and drone assembly facilities at some point in order to have enough space to install the number of workstations that will be needed for assembling enough cameras and drones to meet growing buyer demand. It is management's responsibility to monitor the need for additional workstation space in the company's camera/drone assembly facilities and initiate construction of additional workstation space when needed. And it is management's responsibility to install additional workstations in both of these facilities as may be needed to assemble additional numbers of cameras/drones in order to meet expected buyer demand.

The information needed to make decisions regarding the construction of more camera/drone facility space and camera/drone workstations is contained in the section labeled “AC Camera Assembly Facility” and “UAV Drone Assembly Facility.” In these sections, you have information on the number of workstation spaces available and the number of installed workstations at the end of the prior year. You will also see information relating to whether your camera/drone assembly facilities have adequate assembly capability to meet projected buyer demand worldwide without and with the use of overtime.
**Special Note:** Adding more workstation space increases administrative expenses. Administrative costs to oversee and maintain the company’s two assembly facilities average $2,700 per workstation space. In Year 5 administrative costs for the 300 workstation spaces currently in the AC Camera facility totaled $810,000. Administrative costs for the 110 workstation spaces in the UAV drone facility totaled $297,000. In future years, administration expenses will increase by $2,700 for each new workstation space added to the camera assembly facility and the drone assembly facility.

**Overtime Assembly.** The maximum number of units that can be assembled at overtime is 20% of annual PAT productivity (the number of units a PAT is able to assemble each year without the use of overtime). PAT members are paid 1.5 times the hourly base wage for overtime assembly. *The hourly base wage is the annual base wage divided by 2000 hours.*

The big issue you have to investigate is whether it is more economical (1) to use overtime to assemble enough cameras/drones to fill projected buyer orders (which can delay the purchase and installation of more workstations and the expansion of assembly facilities to provide more workstation space) or (2) to try to minimize overtime assembly at overtime rates of pay by having in place sufficient workstation space and workstations to assemble projected buyer orders.

*It is a quick exercise to view the on-screen projected labor cost outcomes associated with using overtime (see the numbers in the “Unit Assembly and Labor Cost” section), then make the “what if we add workstations/expand facilities by amounts sufficient to avoid overtime” entries and see if the resulting labor costs per unit assembled are higher/lower.*

**Special Note:** Is the Overtime Cost per Camera/Drone Really 50% Greater than the Regular Time Cost? Overtime costs per camera (or drone) assembled are calculated as follows: Suppose a company’s base wage is $21,000 annually per camera PAT member and that camera PAT productivity is 3,000 units per year. A base wage cost of $21,000 per year per PAT member equates to base pay of $84,000 for a 4-person PAT. Dividing a PAT’s $84,000 base pay by 3,000 units assembled annually equals a regular-time labor cost of $28.00 for assembling one camera. Since overtime pay is 1.5 times the regular-time cost, the labor costs of assembling one camera at overtime would be $28.00 x 1.5 or $42.00.

Now how does this compare with the regular time cost? Suppose that a PAT member’s total compensation (base wage + assembly quality incentive + attendance bonus + fringe benefits) is $27,000 annually, which equates to annual total compensation costs of $108,000 for a 4-person PAT. Then, if PAT productivity is 3,000 units annually, the full regular-time labor cost of assembling one unit is $108,000 divided by 3,000 units or $36.00—which is $6.00 under the overtime cost of $42.00 per unit.

The reason why the overtime labor cost of assembling one camera is only modestly greater than the full regular-time cost per camera assembled is that a company’s costs for quality incentives, attendance bonuses, and fringe benefits are not a part of calculating overtime pay whereas they are included in calculations of total labor costs per unit assembled.

**Adding More Workstation Space.** Should there not be sufficient unused workstation space in the company’s camera/drone facility, then you will have to decide whether to initiate construction of additional workstation space.

*Additional space for camera/drone workstations can be built at a cost per space that declines as the size of the space expansion increases—facility expansions can be as small as 10 spaces or as large as 150 spaces.* Space expansions are undertaken at the beginning of a year and take several weeks to complete. However, both the camera and drone assembly facilities have enough unused space to accommodate the immediate delivery of additional workstations and set them up temporarily in the unused space until a facility expansion is completed; thus, your company has the ability to gain full-year assembly...
capability for newly-purchased camera/drone workstations even when permanent workstation space is temporarily lacking in either the camera or drone assembly facilities pending the completion of whatever workspace expansion projects you have initiated.

**Remember:** Administration expenses increase by $2,700 for each new workstation space added to the camera assembly facility and each new workstation space added to the drone assembly facility.

The capital costs of facilities expansions are paid in full in the year they occur and are depreciated over 20 years at the rate of 5% annually.

At the bottom of the page, you can see the capital expenditures your company will have to make this upcoming year to cover the costs of expanding your company’s assembly facility to accommodate additional numbers of workstations.

The company has enough land at its Taiwan plant site to permit expansion of the camera assembly facility to accommodate 1000 workstations and expansion of the drone assembly facility to accommodate as many as 800 workstations (although it is highly improbable that you would ever need this many workstations).

**Important Note:** All expansions of assembly facilities are permanent — you will not be able to dispose of unneeded facility space once it has been constructed.

**Installing New Workstations.** If there is a projected shortfall in assembly capability with full use of overtime (or if management deems it is economical to avoid use of overtime assembly because of having to pay workers 1.5 times the base wage for overtime assembly), then the company’s management team will have to decide whether to spend the money to install some number of new workstations in the unused workstations spaces.

*New workstations can be installed at a cost of $125,000 for camera workstations and $175,000 for drone workstations each;* adding workstations can be done quickly (usually during a single weekend) at the beginning of each year. The capital costs associated with installing new workstations are depreciated over 20 years at the rate of 5% annually.

At the bottom of the page, you can see the capital expenditures your company will have to make this upcoming year to cover the costs of the workstations entered in the decision box.

**Important Note:** All additions of new workstations are permanent — you will not be able to dispose of unneeded workstations once they have been installed.

**Workforce Size is Managed Automatically**

Because every company’s management team is burdened by some amount of uncertainty regarding exactly how many orders for camera and drones the company will actually receive each year (projected buyer orders worldwide may be higher/lower than actual buyer orders), it is difficult at the beginning of each year to know exactly how many PATs will be needed to fill all incoming orders for cameras/drones. To remedy the adverse consequences that can come from forcing company managers to guess how many PATs to hire at the beginning of the year (and then living with having hired too few or too many PATs), the GLO-BUS system automatically employs the “optimum” number of PATs to fill *actual incoming orders* for cameras/drones. Here is how it works:

- If actual orders for cameras/drones turn out to be less than the assembly capability of all installed workstations without the use of overtime, then GLO-BUS will “right-size” the workforce and staff only the number of workstations needed to assemble the units ordered worldwide.
• If actual orders are greater than the assembly capability of all installed workstations without the use of overtime, then **GLO-BUS** will have PATs work overtime (up to the maximum 20% of annual PAT productivity) to assemble enough additional units to satisfy buyer demand.

• If actual orders for cameras/drones **exceed** the assembly capability of all installed workstations with **maximum use of overtime**, then your company is stuck with a shortfall in assembly capability, and orders in the amount of the shortfall will go unfilled (causing the affected buyers to switch their purchases to rival brands).

**Why Does GLO-BUS Make These Automatic Adjustments for Your Company?** These adjustments are made on your behalf to keep things as realistic as possible. If you were running the company in real time, you would simply adjust the number of cameras/drones assembled up or down on a daily or weekly basis (by hiring or laying off PATs) to match assembly volume to actual incoming buyer orders over the course of the year. But in **GLO-BUS** you have to settle on decisions of how many to assemble in advance of knowing what the exact number of incoming orders will be. So, automatically adjusting units assembled to match buyer orders (provided sufficient installed workstations are available) is cost-effective, helps avoid lost sales, and is in your company’s best interest.

The company maintains an updated list of several hundred appropriately-skilled workers living within commuting distance of the company’s assembly plant that it can draw upon to form new PATs to staff any idle workstations that are needed to fill incoming buyer orders. These workers have sufficient experience and qualifications that they can be adequately trained in a matter of days to assemble cameras/drones at productivity rates equal to the company average.

**Tip:** There are going to be decision rounds when your company’s actual sales of cameras/drones come in below what was projected (because of stronger than expected competitive efforts from rivals), and there are going to be times when buyer demand for your company’s cameras/drones turns out to be greater than projected (because of weaker than expected competitive efforts from rivals). **One thing for you to consider is to make it standard practice to have a few more installed workstations than needed to meet projected buyer demand just in case unit demand turns out be higher than projected:** then there will be no shortfall in assembly capacity to fill buyer orders and no lost revenues/profits. There is little risk to such a practice because unit demand for both cameras and drones is reliably projected to grow over time—in other words, any unused assembly capacity in one year is likely to be needed the following year.

**Special Note:** The company incurs administrative expenses associated with managing the PATs needed to assemble cameras/drones. Experience indicates that administrative expenses associated with workforce management (hiring new PATs when needed, laying off PATs when needed, and supervising PATs in assembling cameras/drones) average $5,500 per PAT employed. Thus, administrative expenses associated with workforce management each year vary according to the total number of camera/drone PATs needed each year to assemble the needed cameras/drones. For example, should your company’s total number of camera/drone PATs employed increase from 400 in the prior year to 420 in the current year, then your company’s workforce-related administrative expenses will increase by $110,000 (20 x $5,500) to a total of $2,310,000 (420 x $5,500). Should the number of PATs employed drop from 400 to 390, then workforce-related administrative expenses will decrease by $55,000 (10 x $5,500) to a total of $2,145,000.

**The Robotics Upgrade Option**

You have the option to upgrade the assembly process by installing robots at each camera and/or drone workstation. Whether it makes good economic sense to shift to robotics-assisted assembly of cameras and/or drones is a matter for company managers to evaluate.
Robotics manufacturers have recently developed small robots capable of performing some of the tasks/work steps in assembling both AC cameras and UAV drones. Installing robotics at each camera/drone workstation enables the size of PATs to be cut from 4 members to 3 members. **These robots cost $150,000 each.** If the company decides to shift from manual to robotics-assisted assembly, all existing workstations in the camera or drone assembly facility must be upgraded to include robotics at a cost of $150,000 each, and all future workstations the company installs for that facility must include use of a robot (which means that the capital cost of each additional camera workstation will increase from $125,000 to $275,000 and that the capital cost for each drone workstation will increase from $175,000 to $325,000).

Shifting to robot-assisted assembly also results in **added annual maintenance costs of $9,000 per workstation**, pushing the total maintenance cost per camera/drone workstation from $6,000 annually to $15,000 annually. The robots require monthly maintenance and also, from time to time, break down and have to be repaired. Moreover, annual maintenance costs per robot-equipped camera/drone workstation increase by an average of 1% for each 1% that PATs work overtime. Thus, if a robotics upgrade is undertaken and if PATs work the maximum 20% overtime in assembling cameras/drones, then maintenance costs per installed robot-equipped camera/drone workstation will rise 20% from $15,000 annually to $18,000 annually.

The cash outlays for capital costs associated with robotics upgrades of existing workstations and any new robot-equipped workstations are incurred in the year of purchase; depreciation of these assets occurs over 20 years at the rate of 5% annually.

**Do not be alarmed if electing to do a robotics upgrade causes projected year-end cash balance to be negative.** As with all types of capital expenditures, the associated cash outlays can be partially or wholly paid for the proceeds of new issues of common stock or borrowing (unless management has previously undertaken unfortunate actions that have crashed the company’s credit rating).

Robot-assisted assembly can be used in one facility and manual assembly can be used in the other facility, either indefinitely or until such time as management decides to shift over to robot-assisted assembly for both products. Once robot-assisted assembly has been adopted for a camera/drone facility, it is not feasible to revert back to all-manual assembly.

The page contains calculations that assist in evaluating the cost impact of a robotics upgrade. To explore the economics of instituting robotics-assisted assembly, enter a trial decision to “upgrade” and review the cost impacts just below, along with the capital costs of the upgrade at the bottom of the page. How your company opts to finance the upgrade cost affects the economics. You have four options for paying the capital costs of the upgrade: (1) pay cash for the upgrade (assuming you have a sufficiently large cash balance), (2) issue new shares of stock to raise enough equity capital to pay for the upgrade, (3) borrow the money by taking out a 1-year, 5-year, or 10-year loan, and (4) some combination of the first three options. Borrowing some portion of the capital costs for the robotics upgrade will create interest costs; the impact of the interest cost will be calculated if you enter the percent of the upgrade cost to be financed with debt. Bear in mind that interest costs will disappear when the loan is repaid (your company always has the option to pay down loan principal early if sufficient internal cash flows later become available).

[Back to top](#)

### Capital Expenditures for Cameras and Drones

Adding more workstation space, installing more workstations, and/or upgrading to robotics-assisted assembly all involve capital expenditures (fixed asset investments) that must be paid for in full in the year initiated. Expenditures for these types of fixed assets are depreciated over 20 years at the rate of 5% annually. **Whenever your company undertakes a significant amount of capital expenditures, your company’s projected year-end cash balance may turn out to be negative** (see the Company Performance Projections...
box). **Raising money via new stock issues and/or borrowing is a normal and perfectly acceptable way of financing capital improvements—especially when your company has a B+ or better credit rating.**

When you get to the Finance Decisions page (typically the last page you need to visit because making changes on all the other decision pages will affect the size of the projected year-end cash balance), you can finance any capital expenditures in any of 4 ways: (1) pay cash (a positive projected year-end cash balance indicates your company is expected to have sufficient internal cash to cover all operating expenditures and all capital expenditures) (2) issue a sufficient number of shares of stock to raise enough equity capital to end up with a positive year-end cash balance, (3) borrow enough money by taking out a 1-year, 5-year, or 10-year loan to end up with a positive cash balance, and (4) use some combination of cash, stock issues, and debt.