How to Acquire an ATC Training Simulator

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Assuming that you want to start professional air traffic controller education of some kind, this e-book discusses some issues regarding how to get a training simulator that can serve the purpose. Of course, it applies also if you want to upgrade or expand an existing simulator. This e-book is applicable to very small up to very big simulator systems.

For a broader context, see our e-book How to Establish an ATC Training Center. For more details about what an ATC Training Simulator is, see What is an eCoach ATC Simulator?

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Background: About COTS Products

COTS is a common term for "Commercial off-the-shelf", meaning that the same product is (on the shelf and) sold in many copies. In earlier days, large software systems with a limited market were often custom made to the customer's detailed requirements at a high cost – i.e. not COTS. Nowadays it is common for a supplier to have several software packages that together form a scalable system. Much like when buying a car – you can choose a brand and then select the engine alternative, color, accessories, and so on. Your selections will impact the end price. This way, more customers can share the development cost so the price for each is much less.

If you are not forced by law or similar to send out a request for bids, you might just go and purchase a COTS product that fulfils your needs. This e-book assumes that you will ask for competitive bids related to a set of requirements that you issue. However, it might also serve as a checklist regarding the COTS product you consider buying. Note that this approach might lower the threshold for starting up controller education because the simulator costs are now low enough.

The Challenge

Regarding acquiring a simulator system – or in fact any large computer system – you face the challenge to find the right balance between:

1. Including a lot of requirements – possibly some that you don't really need but include "just in case" – and losing bids from very good COTS systems because they can't fulfil all your requirements. The supplier deems it too expensive to develop all you ask for.
2. Including less amounts of requirements – possibly you omit a few that you should have included – and ending up with a system that doesn't meet your needs. However, this can be avoided with proper precautions as described later.

Be aware that times have changed a lot the later years regarding such systems. If your system needs to be custom made, you want to make sure all needs are reflected in the requirements before you sign the contract, i.e. option 1 above. However, chances are close to 100 % that you will not get a system that starts from the beginning regarding development. For this reason, we recommend that you lean towards option 2 above. So how to do this in practice? Keep reading!

Requirements

When it comes to investments of the kind we discuss here, a major concern is the requirements you are going to issue; They will determine the system you end up with. You obviously want a system that is sufficient to satisfy your training aspects, and you don't want to pay more than you have to. And regarding payment, both the purchase and the long-term costs related to the use of the system are significant to consider.

This blog will highlight many aspects to consider regarding your new simulator system and its operations. How to follow up regarding stating related requirements before purchase is entirely up to you. The goal should be to achieve an optimal cost / benefit ratio in the long term. The key to this is to include requirements that you really need and are going to use, and not include requirements which will add to your cost and not give you any benefit back. You also want the possibility to expand if needed, both in terms of capacity and functionality.

For the rest of this blog, ask yourself: Should I state any requirements against this, or not? You can also state your wishes more mildly by using the word "should" instead of "shall" – shall indicates a mandatory requirement that must be met, whereas should indicates a customer preference that is not strictly necessary.

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The Installation

You will always need to give your future supplier a view of your thoughts regarding the initial installation. Preferably also whether you foresee to do later expansions. Data that must be included in any request are:

1. What type of training will you offer? ACC/ Approach, i.e. radar working positions, and/or Tower control?
2. If tower control, what type of 3D presentation would you prefer? TV screens or projectors? How wide a view in the 3D visualization: 180°, 270°, or 360°?
3. How many positions of each, i.e. how many students will train together at one time at what type of positions?
4. Will you run parallel sessions in multiple simulators at the same site? If you want both tower and ACC / Approach control, consider them two simulators although they can be controlled by the same pilot positions.

Without such information, it is impossible for a supplier to give you an initial estimate and later on a committing bid. To test if you can expand your installation later (after blooming business is a fact), you can ask for optional extra positions. This will reveal if the system can be expanded at low extra cost. Some suppliers might even support training at different geographical sites, e.g. with pilots at one location and students at another. This concept has been used with success in Norway for several years.

The expected delivery times might be of interest to you, and how work can be performed in parallel to reduce the construction and training period. So some indications of your plans regarding timing should be included.

Run-time Situation

You will need personnel to run your training center, and this is a cost. Also, the customer – i.e. the students – will want efficient use of time when they are at your site. There will be a cost impact related to how smoothly your center can be operated. This aspect can be seen in several contexts – some rules of thumb that seems reasonable are included in the list:

1. System start-up times:
   a. From power on until ready to start the training – 5 minutes.
   b. From one session finished until ready for next one – 2 minutes.
   c. From finished session until ready to run synchronized voice/data playback from any time of the session's recording – 2 minutes.
2. Ease of use: This applies to both controller side and pilot side:
   a. Controller side: If you want to provide continuation training to experienced controllers, the controller position should be quickly and easily adaptable to reflect the system that the controller is used to in his daily work environment. Preferably, the finished setup should be stored for later use.
   b. Simulator pilot side: You want any certified aircraft pilot to be quickly able to pilot a simulator training session. This is valuable initially, when the sim pilot is totally new to the system, but also in the long term because it is not unusual that people can shift between jobs and be part-time simulator pilot at your site. Then it is important to quickly remember how piloting is done after some time away. Initial training should be finished in two weeks or less and the sim pilot should then be ready to support training.
3. Pilot efficiency, i.e. how many pilots you need in order to support a group of students: This will depend on the complexity of the exercise, but a rule of thumb is one pilot for each student controller, give or take.

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4. Exercise preparation time, i.e. how long it takes to prepare an exercise: Two hours should be sufficient to prepare a typical exercise for a medium size airport, provided that the exercise contents are planned up front – weather settings, traffic data, and vehicles. If several exercises are fairly equal, e.g. opposite runway in use, this time should be much less.

5. System stability: Obviously you need a system that keeps running without faults that leads to session abort. You should be able to run at least a thousand exercises between each failure that aborts a session. This might not include hardware equipment such as light bulbs – in a projector-based tower simulator – and paper strip printers, because these depend on the quality you choose and how the equipment is maintained.

6. Technology platform: Your simulator will run under some operating system on some computer hardware. After some years, this will need to be replaced. Be aware that there is no big difference between an ATC training simulator and a regular office environment. Therefore, it might be wise to select computers and operating system that is widely available and proven in use after millions of accumulated hours. The chance of getting help of various kinds will be better the more standard the platform is – you might even have the expertise in your organization already. To be specific: Microsoft Windows 10 operating system is a good choice.

These aspects are relevant to your long-term costs regarding your simulation center, so you might add requirements against it in a tender process.

System Safety

Obviously, there are no safety requirements related to an ATC training simulator; No fault will lead to a plane crash or other accident. However, the topic is not without interest from a cost perspective.

If you require adherence to various standards (not only safety), you might bring on some major cost elements and exclude systems that would have served you well. Also, the long-term aspect related to upgrades can be costlier and more difficult. This goes back to the recommendation don't ask for it if you don't really need it.

A supplier of a certified ATC system for operational use might add a traffic data generator to it and market it as a simulator. This can be a really good system, but be very aware that the traffic data generator is imperative for giving you realistic training sessions. The ATC system will only present what the data generator sends to it. Chances are also that the ATC system will have functionality that you will never need, which can give a complicated and not so adaptable user interface. Updates of functionality can be limited due to the bindings to the safety process. Consider the previous chapter, and the cost element.

Functionality

Generally, your training needs should guide your requirements related to functionality. Again: If you don't explicitly need it, don't require it. For example, in a simulator system you would most likely never need Medium Term Conflict Detection (MTCD). For tower training absolutely not. Unless you are sure you need it, don't ask for it because it is a rather complicated function that most likely will add cost.

Examples of training needs that is not obviously supported by a COTS product can be:

1. Helicopter operations: Helicopters can do many things that a fixed wing aircraft cannot, and this functionality might be important for your training center.
2. Military operations: Handling of formations related to take-off, airborne, and landing. Support for break patterns and simulated flame-out patterns.
3. Winter operations: De-icing and snow ploughs control.

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4. Airport lights control: Stop bars control in low visibility conditions.
5. Strip handling concept: You will want to replicate the student controller's normal working environment which might include electronic flight strips and/or printed paper strips.
6. Voice communication system (VCS): If you want to place student controller(s) and simulator pilot(s) in separate rooms, you need a VCS. In a very small simulator, they might talk directly to each other, and you don't need a VCS. This would of course reduce the realism in the simulation.
7. Flexible and easy to use VFR control: Pre-defined traffic patterns, functions for approaching the airport, variants of touch-and-go.
8. Unless you want ab-initio training at some dummy airport, you should state what airport(s) you want as subject to your training, and also a list of aircraft types and liveries. Expect a lot of the aircraft to be available already as COTS, but some might have to be produced.

It is much more important that you think through your potential exercises and state requirements based on that, rather than providing a full list of requirements, including the obvious. Our recommendation would be to filter out the system candidates that can support your explicit needs and then compare the candidates' other available COTS functionality in the negotiations phase. If your organization's purchase process rules forbid direct contact with a supplier, ask for written material like user manuals etc. However, if permitted by the rules, go to a site in operation and talk with experienced users, look at demonstrations, try the system for you own, and then decide.

Financial Terms

Your supplier might be able to offer various terms of payment. You should expect to pay some amount at contract signature or at an agreed date, because the supplier will need to purchase hardware in order to set up your system. The remaining amount can be paid in various ways – the following list indicates invoice times:

1. All at once when Site Acceptance Test is completed and approved by the customer. The customer, i.e. you, will keep the equipment and permanent software licenses.
2. Down payment over an agreed period, at agreed intervals. At the end, the customer will keep the equipment and permanent software licenses.
3. Rental payment at agreed dates for an agreed period. When the period is finished, the customer will keep the hardware but the software licenses will expire and the simulator cannot be used for training purposes any more.
   a. The rental payment amount can be calculated in various ways: Fixed amount per time interval, based on simulator use (with a certain minimum), or other.

What you pay for is in two parts:

1. The hardware that the system runs on. This can be COTS hardware and operating system (for example standard office PCs with Microsoft Windows 10).
2. The software licenses. This is the variable part of the contract. The total amount you pay will vary depending on the option chosen (ref. the above list).

Preferred payment model should be included in the request sent to potential suppliers.

Of course, "permanent software licenses" indicates what is needed in order for your personnel to use your simulator. It will be limited to the number of working positions you have ordered, and it will not be possible to copy for other use in any way.

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Supplier Selection

If you have invited several suppliers to bid on your new system, you have probably also included a formula saying how you will choose the lucky one. What you state in this regard is of great importance. Let us consider some alternatives.

1. Price only – This is seemingly a very easy solution, but could legally force you to buy a system that is not what you want. In this case, you state that the one who is compliant with all your requirements and offers the lowest price will get the contract. More about that later.
2. Price and warranty – In this case you state for example a formula like this to assign score points to a supplier's bid: The lowest of all bids divided by the supplier's bid, multiplied with 76. This gives a maximum score of 76. Then add one point per month warranty more than one year, up to three years total as maximum. This means that e.g. two years' warranty would give 24 extra points, i.e. 100 as maximum total points.
3. Price, warranty, and technology – In this case you open for choosing a supplier with better technology even if the bid is not the lowest. This is the solution we would recommend for several reasons as discussed in the following.

More Requirements Considerations

Some purchasers will choose the strategy to state requirements for "everything", insist that all of them should be met, and select the lowest bid among the remaining candidates – i.e. option 1 above. Let's first consider "everything": To simplify, assume you want to purchase a calculator. You state all you can think of regarding functions, size, weight, and so on. The lowest bidder has a solution where the display is at the opposite side of the buttons because that made the technical solution much simpler and thus much cheaper. Did you remember to state that the display and the buttons should be at the same side? General requirements like "user friendly" will be hard and expensive to bring to court for independent decision. The point is that it is impossible to think of everything up front. And you don't want to, because the supplier has already put years of thought into his solution, and if your thoughts doesn't match the supplier's, he must choose not to bid. The purchasing company's administration might assume that their expert users will think of everything and state a perfect list of verifiable requirements, but sadly that is most likely not true. Number 1 strategy (ref. the list above) could lead to large expenses in the long term even if the bid is the lowest – ref. the chapter "Run-time Situation" above.

So, what do we recommend? Go for option 3! Also, don't state that "all requirements must be met, otherwise the bid will get rejected". It is not necessary, and maybe the supplier has found a genius solution that is different from the one you (and/or your requirements people) have foreseen and stated as requirements. Let your core needs direct the requirements, not the solution for them. And leave room to let good solutions count (legally speaking) in the final decision – not only the price tag. Your technology rating will be yours subjectively, and will provide you with full flexibility in choosing the supplier that will serve you the best in the long run.

Summary

This e-book is generic and applicable for large and small ATC training simulator installations. What is "large" and what is considered "small" can vary a great deal, but the main point is that via careful selection of requirements, you can reach your goal of getting a long-term cost effective ATC training simulator. Hopefully, this e-book helps you in the selection of requirements.

We would very much like to hear about your project, and we might be able to help you. If you feel like it, please do send us a few words about your thoughts. If you want price estimates, please include data as described in the chapters "The Installation" and "Financial Terms". We will give you our comments and price estimates without any charges.

For further information and illustrations, please have a look at our web site including blog and downloads. Hopefully you will find information that will help you out in your efforts.

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About Edda Systems

Edda Systems was established in Norway in 2005 by technical and ATC experts from many years in operational air traffic control. Our eCoach ATC Training Simulator and associated products are in daily use in small to large installations in several parts of the world.

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