Suggested Software

UKSDC has no affiliation with any of the software creators mentioned below or indirectly by the name of their product.

Organisational Software

Google Drive (Recommended)
https://www.google.com/drive/
A Google Drive is the advised way to create and share resources. You can use Google Slides to create your presentation, Google Docs to write notes, Google Jamboards for your initial brainstorming and Google Sheets to calculate your costs together. Google sheets can also be used to construct a compliance matrix which can keep track of who is doing what task within the company.

Tinyurl.com
Tinyurl is a brilliant service to make the shared link to join the team Google Drive easier to input and distribute.

Onedrive
Another way to keep all of your resources in a single place. This has the advantage of having access to the more powerful PowerPoint and Excel (relative to the google equivalents) but comes at the expense of being far more laggy when being used by all 50 people in your company (which was always a deciding factor for the author against this option)

Alternative Presentation Software

Both of the above options for Organisational Software also come with the capability to create presentations, which makes them more highly recommended than the software below. However, for the ISSDC, you often are restricted in what software you can use by what students in other countries can access so it is good to be aware of these options.

Prezi
Keynote
WPS Office - used for competitions in China
Docs.qq - Tenecent software, also for use in China (but banned in India)

There are many more, but these are ones I have seen used at international competitions before due to their greater flexibility in different countries. They are not really recommended for any other reasons though.

Calculation Software

Microsoft Excel (primary)
Spreadsheet software without the limitations of Google Sheets. Depending on the required output for your project, this is likely to be the only calculation software you need.

Python
A quick to learn, powerful and versatile programming language with many available editing environments. Python is a good alternative to Excel for tasks that require iterations or cannot easily be couched in the format of a spreadsheet. Our suggested editor for newcomers is *IDLE*.

Any other coding language
We recommend python above because it is quite easy to learn. However if you already have experience with another language then you can achieve the same functionality with almost any coding language.

Artistic Software

Draw.io
https://www.draw.io
An online 2D diagram software with Google Drive integration. Use it to create flowcharts, system diagrams, or room layouts. Download desktop .exe or .dmg if you wish for greater reliability with larger diagrams.

Photoshop or Paint.NET
https://www.getpaint.net/
Most CAD softwares will not output diagrams with dimensions in 3D. Even if they do, it is often necessary to overwrite the actual dimensions to cope with last minute changes. For this it is necessary to have an image editor. Either a downloaded tool or an online one will suffice. Many companies insert a artistic slide showing a beautiful image of their settlement; this will need to be made in a tool like this (or in blender as mentioned below under the CAD Software section).

Procreate
Good for artists who have access to a touch screen device and a compatible pen as it allows you to create nice vector drawings which can be easily scaled when put into your presentation to prevent them becoming pixelated.

Specialist Software for UKSDC

SpinCalc
This software uses data provided by NASA to calculate how fast you will need to spin an object in space in order to create a specified level of artificial gravity, and perhaps more importantly, whether such a thing would be survivable and/or comfortable for your inhabitants.

Floorplanner.com
This software allows you to quickly create detailed floor plans of entire houses with the click of a few buttons, and can then turn these into 2D or 3D models for you to use in your presentations.

Kerbal Space Program
What list of specialist space software would be complete without a good reference to Kerbal Space Program. Whilst you may think of this as only a game, the physics modelling, as well as the knowledge you can gain from the software will help significantly during the competition. I have also seen it used very effectively as a basic CAD software with incredible built in backdrops for some of the more simple designs and this saves significant time on the generation of a CAD model, which is discussed in more detail below.

Computer Aided Design

Introduction to CAD at the UKSDC
CAD has become, over recent years, an integral part of the UK Space Design Competition. Be it in its original meaning as Computer Aided Drafting, used to make clear 2D drawings for floor plans or systems diagrams, or its modern meaning of Computer Aided Design; where CAD is used to design 3D models and even perform structural analyses. While CAD has never been a requirement to win the competition, the benefits it provides can give a competitive advantage in terms of consistency, clarity and time-management.

Effective CAD Workflow
CAD has been used in every facet of the competition from structure to robotics to great effect. I mainly used CAD software to create a single complete model of the entire settlement design and took screenshots from various angles and locations in the workspace to show all of the structural elements.

Other approaches are better in other contexts; a common technique is to individually model each of the structural elements and then reintegrate the parts later into a final model for the presentation. This latter workflow is more effective for modular structures or where features will repeat.

Each workflow has advantages and disadvantages: The first workflow means that all of the structural CAD can be completed by one person (no compatibility or inconsistency issues) and all images can be sourced from one model, however the products will be turned in very late and the deadline for changes to be made is early in the competition. If that CAD artist crashes (either their computer or mentally), all of their work might become useless if no one can take over their files or force-feed them copious amounts of coffee.

The second workflow has the advantages that the products will come in throughout the day and some will be ready in time for the Red Team Review. However, many individual images do not make an "overall view of the settlement". Time and staff will have to be dedicated to making images that explain how images relate to the overall design and ensure that the RFP is fulfilled. These design warnings apply equally to the Human department, however the latter workflow is the only one I have seen used effectively for the Operations, Automation and the Business and Marketing departments.

Advantages and drawbacks of CAD

CAD has the advantage that full colour, perspective images can be produced; some sufficiently powerful software packages can even produce photorealistic images. When choosing which CAD package to use, it is important to consider what output you are looking for, as this will often determine the packages that you can use to produce your model.

However, not all features of a presentation need to, or make sense to, be 3D models. I have little experience with 2D design software other than photo editors. I do, however, recommend the online drawing tool *draw.io* for flow charts and systems diagrams. These can look very professional with only limited time and effort, far outweighing the use of CAD for many applications. Another suggestion is to use the drawing tools available in Microsoft PowerPoint or Google Slides as these can effectively produce simple diagrams which can be just as effective at conveying information as a complex CAD model.

The other main consideration is that of the user: good CAD software is useless if you don't know how to use it. I have seen considerable time wasted by competitors trying to figure out their software during the competition, even though they could have produced a hand drawing better than their final CAD result in the same amount of time. For this reason, it is critical that the CAD artist at UKSDC be experienced with the software, not merely in possession of it!

A final reiteration: CAD of any form is not required to succeed in the UKSDC. This competition is judged based on scientific and engineering merit, not the resources you had available to express them with. CAD is just a bonus to clearly express your ideas to the judges. Some judges even prefer good hand drawings to CAD since anyone can learn CAD, not everyone can draw. The most important thing is to show your design off clearly; the method of doing so does not matter much.

Which CAD Software to use

Autodesk Fusion 360 (Simple, effective, parametric CAD software)
Having tried out many different CAD packages, my recommended software is Autodesk Fusion 360. Fusion 360 balances ease of use with sufficiently advanced parametric design tools to be practical for the competition. I found the software intuitive and powerful with a good range of features and sufficient customizability. The animation, rendering and finite element analysis features are very useful in the competition, especially with free cloud computing available to students to reduce strain on personal computers.

Blender (Difficult but worth it)
As said in the title, Blender is quite difficult to pick up in the first place, but once mastered, is possibly the best software you can use for Space Design Competitions. The non-parametric modelling style allows for rapid production of complex geometries, with easy ability to edit curvatures and dimensions of parts. Whilst it lacks the dimensional accuracy of parametric models, this is not a key feature when doing a CAD model for the UKSDC, which instead relies on a model which can effectively convey a design concept to the judges. However, the most distinguishing feature of Blender is the quality of output graphics that you can produce. Be it a render of your settlement on the surface of Mars or the atmosphere of Venus, large libraries of Blender textures are available to create the desired effect. This leads to the most impressive artistic renders of your presentation, which go a great distance in providing that wow factor that the judges are looking for.

SketchUp (Simple)
As was mentioned when discussing potential drawbacks of CAD, its use is a skill that will take time to learn. If you are looking to pick up CAD software in time for your next competition, or you are only going to it for the UKSDC you may want to consider a more simple CAD package as it requires less time to reach a sufficient level. I have seen SketchUp used for this reason, especially in the Human department. People are able to pick it up well enough for most applications in only an hour or so, but it will not generate the same quality of output rendering as other options (at least not unless you put considerable time into learning how to do this, which in turn defeats the purpose of choosing a simple software)!

Solidworks (Complicated but powerful)

On the other side of the scale, I have seen competitors try to use Solidworks in the competition. Personally, I find the workflow for Solidworks is too intricate and demanding for UKSDC which prioritises rapid completion of work over the final quality of model and graphical rendering (although this is excellent). However, Solidworks does offer the best parametric modelling facilities of any software mentioned here, allowing designs to be modified with little effort, which is incredibly useful when the designs are constantly changing (as your designated CAD Lead will know only too well by the end of the competition)!

OnShape (Power in your Browser)

This is a cloud-based parametric modelling software that is available entirely within your browser. It is free for students and has comparable power to that of Solidworks, but with a more intuitive user interface. Whilst this author has very limited experience with this software, it is being dubbed by some as the future of CAD modelling and is worth checking out if you are just starting out with CAD and want to take a bit of time to learn how to use one of the more useful softwares.

CAD Conclusion

A final reiteration: CAD of any form is not required to succeed in the UKSDC. This competition is judged based on scientific and engineering merit, not the resources you had available to express them with. CAD is just a bonus to clearly express your ideas to the judges. Some judges even prefer good hand drawings to CAD since anyone can learn CAD but not everyone can draw proper engineering sketches. The most important thing is to show your design off clearly; the method of doing so does not matter as much.

Software for space nerds =D

This is a section with software that will almost certainly be of no use to your company during the presentation, but may be of interest to some of the space nerds like me who take part in this competition.

Orbital Modelling Software

These are some of the most commonly used pieces of software in actual spacecraft applications, with huge impacts on satellite constellation planning for communication purposes. These softwares can be used to find orbital transfer times, satellite link budgets, communication data rates and so much more. If you want to be employable in the space market, this is highly recommended

STK - Professionally used software which offers short course certifications and free use for students.

GMAT - A slightly more simple and easier to get hold of software when compared to STK