C-17 SST

SINGLE SYSTEM TRAINER V1.03

Operations Manual

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What is This

The C-17 SST is a teaching aid designed to take advantage of touch based displays, providing a very detailed approach to aircraft systems for the purpose of maintenance. This is done without the limitations of conventional IMI, allowing for freeform operation of the presented systems. This allows instructors to provide students with an interactive version of primary systems that they will interact with.

It can provide random scenarios based off of real-world situations, should it be desired. It is not a replacement for instructors, but a companion allowing for operation by any individual in a classroom setting. For the next year this system will continue to evolve to meet the needs of our airmen, and provide a more effective teaching environment.

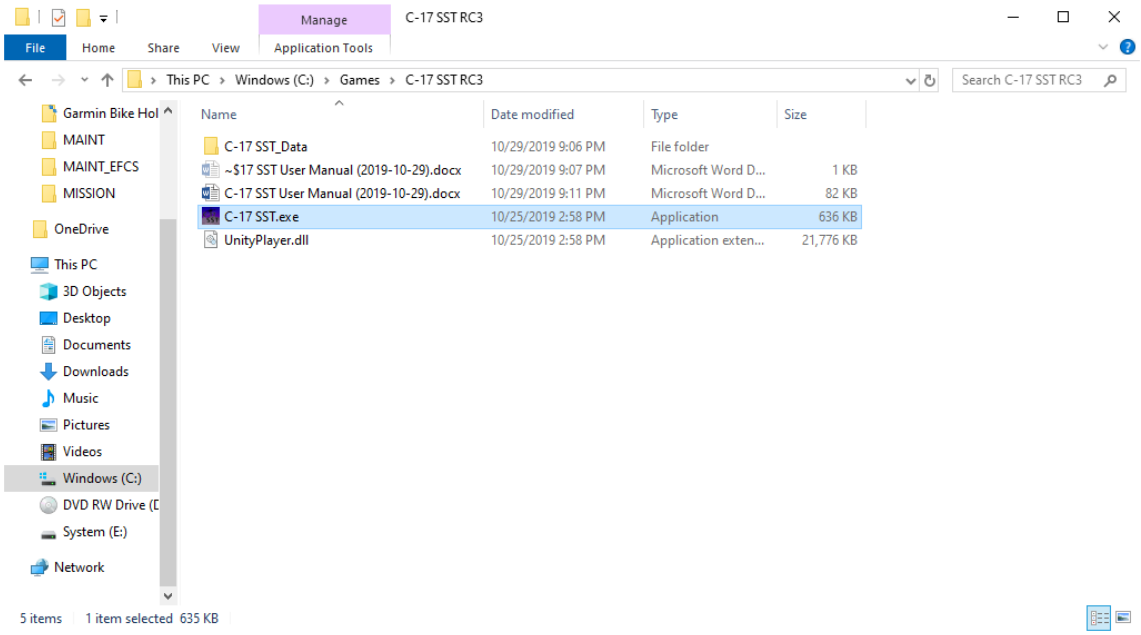
If you like this program and want to encourage further development, please vote for it. The link below is for the AF Spark Tank 2020 competition:

https://usaf.ideascalegov.com/a/dtd/Single-System-Training-Simulations-Aircraft-Maintenence/7236-43

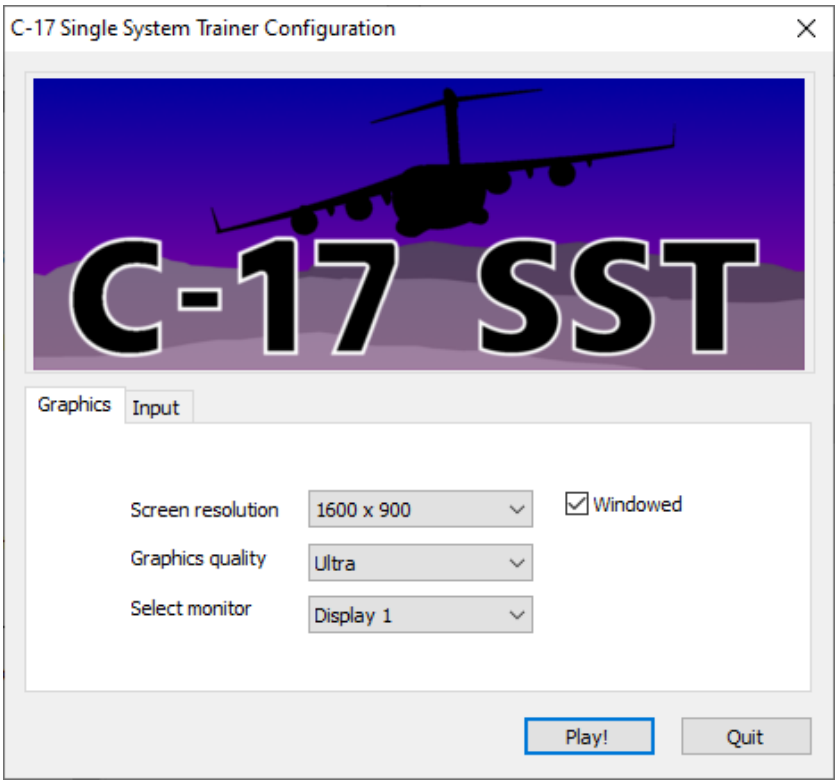
Should you spot any inaccuracies, or have any suggestions e-mail: devin.bable@us.af.mil

How to Use This

1. Open the program.



2. Select a resolution, or full-screen mode:



3. Select a trainer!

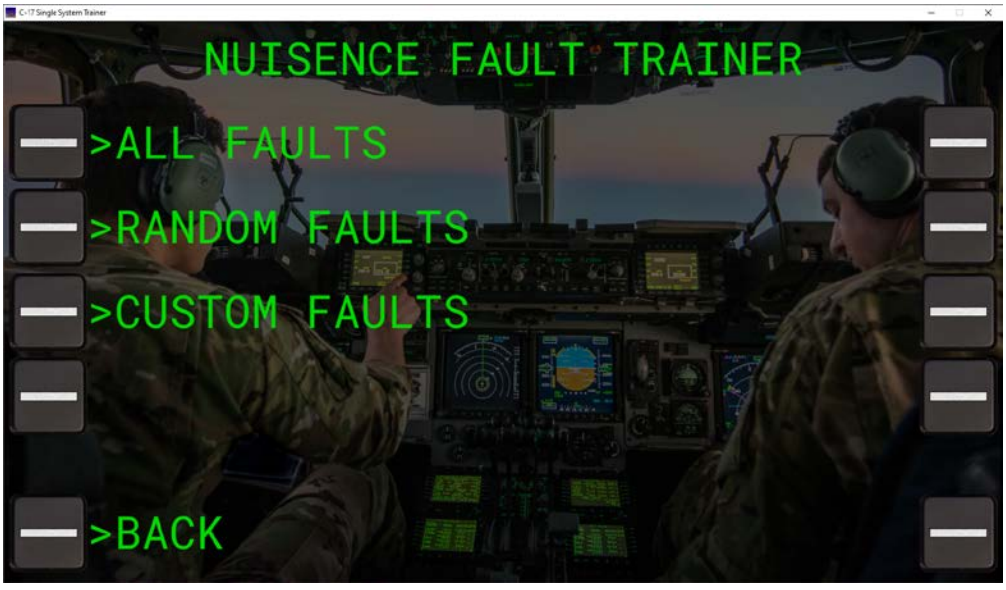
4. Follow the prompts, use it as you see fit, and most importantly have fun with it!

MCD Fault List Trainer

What it Does

Simulates the MCD for the purpose of checking fault lists during a Basic Postflight Inspection. (BPO Inspection)

Modes of Operation



All faults – Every fault will be enabled.

Random – Faults will be randomly selected, not even the instructor will know what will happen.

Custom – Instructor can specify a specific scenario. (NOTE: These settings are not saved)

Custom Configuration - Status

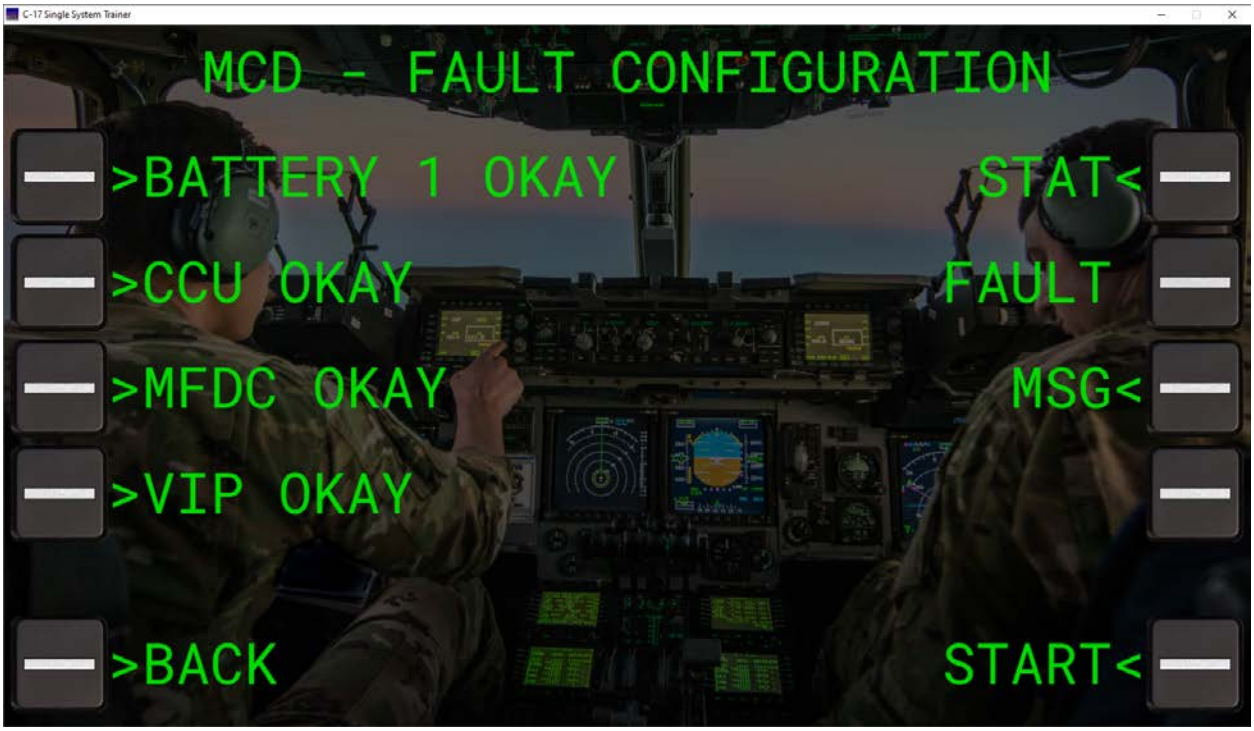
EFIS Reset – Simulates the *EFIS Reset* button having been pressed. While no tech order would spell out that you do this, the reality is this is common practice and should be discouraged. Additionally, if the plane had just flown all associated faults would no longer be on the fault list.

IRU – IRU is aligned and in *NAV* mode eliminating numerous faults. These faults are listed in the chart below. These occasionally are left on after a flight or could be on during other maintenance.

Radar Altimeter – If the aircraft is parked properly these should be off with the breakers pulled. It's possible they could be on for other maintenance. These can be toggled on and off via the EM/COM menus for demonstration purpose.

HF Radio – Could be on or off, causes a few faults. This can also be turned off/on via the HF radio menus for demonstration purpose.

Custom Configuration – Faults



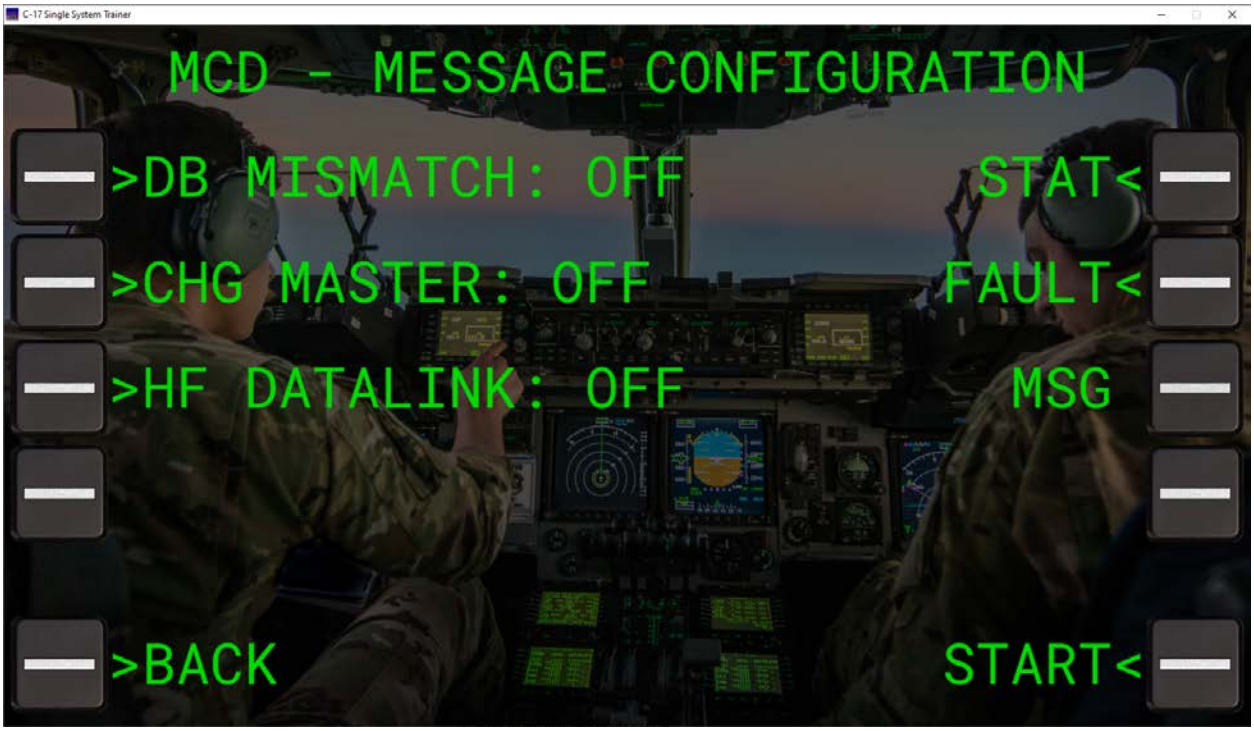
Battery 1 – Simulates a condition on the non-avionics fault list that might be encountered when either the main aircraft battery has discharged and the charger has also failed. This is the only non-avionics fault currently.

CCU 2 – Fails CCU2, this is also displayed on the comm status pages as well. Showing how CCU 1 will take over all functions of the communications bus.

MFDC – Critical BPO fault, indicates that bleed air fire protection might not be operational.

VIP – This fault is used specifically to demonstrate, that some faults don't have names that line up with the associated system. For instance the breakers attached to this system are TAWS 1 and TAWS 2.

Custom Configuration – Message



DB MISMATCH – Adds the *Comm Database Miscompare* message to the scratchpad. While it sounds bad, it is common to see if the aircraft was just powered on.

CHG MASTER – Adds the *Change Master* message to the scratchpad.

HF DATALINK – Adds the *NO HF DATALINK* message to the scratchpad. Usually occurs during power on when the HF radios are still powering up.

Known Issues

- Not every button simulated, it would be nearly impossible.
- Inverse, and small capital letters are not available yet.
- Model for MCD is old style, fonts are new style.
- MC/EDS fault menus is likely wrong.

Failure Scenarios/Easter Eggs

- If you take over 30 seconds to power the display on a helpful message will appear to remind the user to turn it on.
- APDMS1 button is shown as active, but will not do anything. This is meant to be a teachable moment as APDMS1 can only be used from MCD #1/2 locations.
- Attempting to open the RIG and Initialization menus will result in a caution/fail message. Encourage people to stay away from here, attempting to open it again will result in Kung-Fu action.

Fault Chart (Aka. Instructor cheat sheet)

Fault Name	Nuisance	Cause	Extras
CMU-1_ACP1 & 2 CMU-2_ACP1 & 2	Yes	**AVIONICS:** Automatic communications processors are only powered when High Frequency radio is powered.	You can toggle these radios on via the comm pages.
FCC-F_* SEF-F_*	Usually	**AVIONICS:** These faults should disappear after either a flight or pressing EFIS Reset. **Reiterate safety, regarding the common action of pressing this switch without clearing flight surfaces.**	Can only be toggled from main menu.
IRU1 thru 4 FMCIRU*OR FMCIRU*FC	Usually	**AVIONICS:** IRUs are not on and aligned.	Can only be toggled from main menu.
RAD1 & 2	Yes	**AVIONICS:** Radar altimeter fault, if everyone followed the TO, these should be off at all times.	Can be toggled from the EM/COM menus, page 1.
FMCSKE	Yes	**AVIONICS:** Formation Flight System not fully mission capable. This is because either the Radar altimeter, or IRUs are not aligned.	Can only be toggled from main menu.
VIP 1	No	**AVIONICS:** Video Information Processor 1 has faulted, or did not power up. Often fixed with a TAWS circuit breaker reset.	Can only be toggled from main menu.
CCU 2 CCU-CCU 2	No	**AVIONICS & COMM:** Communications Control Unit 2 has faulted, or did not power up. Often fixed with a CCU 2 Primary/Secondary circuit breaker reset.	Can only be toggled from main menu. Can be viewed on comm status page, and comm fault list.
WIU-EXT	Yes	**AVIONICS:** Weather radar is turned off.	Always present.
TCAS-MC_ATT	Yes	**AVIONICS:** TCAS no attitude data from the IRU/Mission computer bus.	Tied to IRU's being aligned in main menus.
TCAS-MC_RALT 1	Yes	**AVIONICS:** TCAS no radar altimeter data from the IRU/Mission computer bus.	Always present.
TCAS-UPPERANT	Red X	**AVIONICS:** TCAS upper antenna has failed. And will require service.	Always present.
WCC-ABC	Yes	**AVIONICS:** Anti-skid brake controller is turned off.	Always present.

APM-SAU	Yes	**AVIONICS:** Signal acquisition unit not getting propulsion data. Engines are not running.	Always present.
WCC-MFDC	No	**NON-AVIONICS:** Manifold Failure Detection Controller is inop/faulted. This is a critical Red-X item. If applied bleed air should be removed from aircraft immediately. This is also directly listed in work cards.	Can only be toggled from main menu.
WCC-BAT CHG 1 WCC-BAT 1	No	**NON-AVIONICS:** Battery 1 or it's charger is faulted, and requires service.	Can only be toggled from main menu.
B1APM-ECO	Yes	**PROPULSION:** Electronic Engine Control has no power. This is normal unless the engine is running.	No extras.
1 ENG EGTA	No	**PROPULSION:** Engine experienced an EGT over-temperature scenario. Only engine 1 – Zone A is currently implemented.	Also listed in fault history.

Interphone Control Set

What it Does

Simulates an ICS panel for the purpose of demonstrating how the ICS panel works, sounds, and feels. It also covers a number of common scenarios that are easily fixable by technicians at any level. By incorporating those scenarios it could potentially prevent false positives and mission delays due to minor issues.

Interface Options

Dice Button – ICS panel will be set to a random state, can be useful for having student learn how to navigate various options.

Mute Button – Will mute all radios, but leave all other settings as is.

Position – Select various ICS positions to get a visual representation of its location. By default it starts in maintenance mode with the overhead switches visible. I don't recommend using this feature currently.

Toggle CCU – Enable/disable CCU fail message.

Switch Type - Toggle Switch

Touch and drag these switches up and down – These can either be two-way on/off switches, or three-way with a middle position.

Switch Type – Rotary Knob

Due to the nature of these knobs being push/pull, you can not use a rotation gesture. Going up will push the knob in, going down will pull the knob. Left and right will rotate the knob, animations might not be implemented upon release, but audio feedback is provided.

Switch Type – Push Button

On and off, tap to toggle it on and off, not much to it.

Known Issues

- Some radios will not have sound
- Degrade light does not illuminate when set to backup mode
- “Ground Ops Power” can get stuck in the on position
- “R” does not change to a “T” on radios that are transmitting

Failure Scenarios/Easter Eggs

- Turning on “Ground Ops Power” will cause a failure screen to appear. This switch is right next to the maintenance interphone switch, and on occasion is toggled by mistake. Encourage people to pay attention, attempting to open it again will result in Kung-Fu action.
- ADF is turned to a classical 50’s radio recording, to show that it can receives AM radio stations
- “Check Switch” is simulated, just set the mode knob to the wrong position
- “Backup” can be activated from selector panel on maintenance mode screen
- Failing the CCU will also mute all sounds

Revision History

This content is more for historical information, for anyone curious of the development process/history

Version 1, Update 3 ← YOU ARE HERE (March 16, 2020)

- Fixed bug where EFCS pages could freeze program
- Removed mute button from ICS panel
- Doubled ICS knob sensitivity for use on larger screens
- Fixed ICS bug where knobs could keep rotating when not touching the screen
- ICS position screens have better art, and now disable all panel actions
- NAV radios default to off when randomizing radios.

Version 1, Update 2 (March 5, 2020)

- Added EEC 1-4 faults on non-avionics fault list (Submitted by: Sgt. Winkler)
- Added second page to fault list
- Corrected EFIS to EFCS

Version 1, Update 1 (March 2, 2020)

- Fixed issue with fault randomizer failing to update list
- Removed refuel trainer listing outside of demonstration mode
- Added animations to ICS panel knobs

Initial public version (October 30, 2019)

- Wrote this user manual to aid in use of this system
- Further refinement of sounds
- Added more failure scenarios

Final Demo before release (Oct 2019)

- Logos added
- Load screen added
- Feedback from sessions 1 and 2 incorporated
- Presentation mode added to cover SST theory

Feedback Session 2, performed with TSgt Justin Higginbotham (July 2019)

- Initial rollout of ICS panel
- First live use of ICS portion in a classroom, thanks again!

Feedback session 1 performed with SSgt Lance Wright (July 2019)

- Numerous fixes, and pages added to further enhance BPO fault list training
- First live use in a classroom, thanks!

Demo 3 (July 2019)

- Continued improvements, finalized art for MCD sim

- Changed fonts to more readable format of new MCDs
- More faults, and general refinement
- ICS panel initial simulation
- Training utility is now all in one, SST concept/name is adopted

Demo 2 (June 2019)

- Added custom faults menus
- Texture mapped MCD added
- Removed integral jack simulation, no interest

Demo 1 (Feb 2019)

- Updated animation testing, Aft/Fwd Hydro panel sim testing
- Initial implementation of sounds to further training fidelity
- MCD trainer initial version

Initial Testing (December 2018)

- Animation/button tests for possibility of simulating integral jack

Credits

Dealing with all the associated craziness from this project:
Mrs. Rebecca Bable

Content/programming:
Sgt. Devin A. Bable

The initial spark for this project:
Sgt. Aaron Jagow

Enduring a constant bombardment of questions during development:
Sgt. Aaron Jagow
Sgt. Kyle Busby
Sgt. Rudy Arciaga
Sgt. Michael Sangenario
The entirety of 373TRS J3/J4

Providing/researching a list of requested faults for MCD trainer:
Sgt Erin Winkler

Testers/Initial guinea pigs
Sgt. Lance Wright (And for allowing me to film his class!)
Sgt. Justin Higginbotham (Also the push for an ICS simulator!)

Allowing me time to work on this project:
Mr. Edward Hayes

Providing multiple chances to show this program off:
Capt. Dominic Scaletti
1st Lt. Marlene Waterman
Sgt Jess Denton
Mrs. Jessica Lovette