MilViz F-4E/J/S ADV Manual

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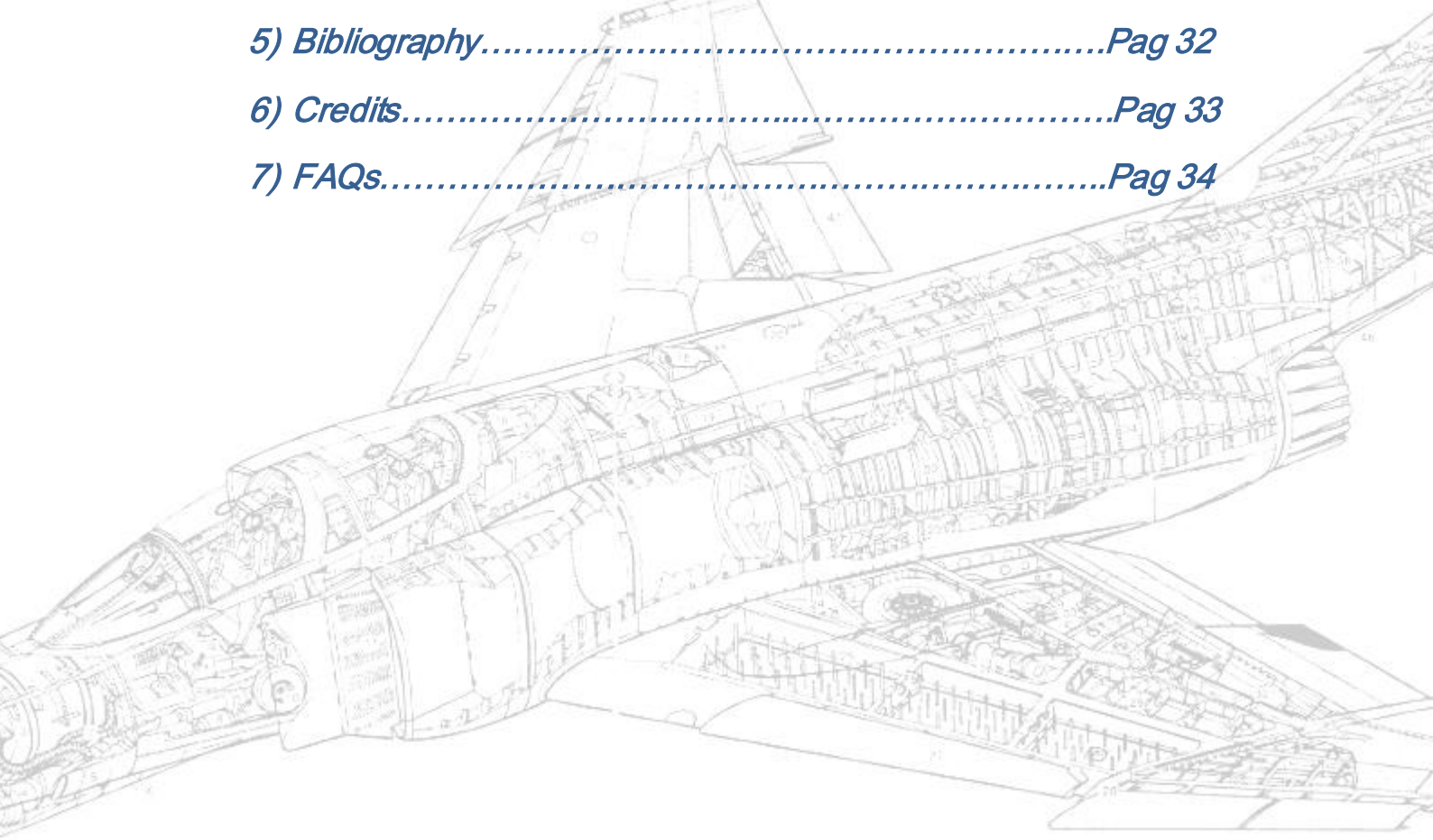


1) Introduction:

The F-4E ADV & F-4J/S TP-ADV modules are Milviz projects inscribed within the aircraft "Advanced Series" (see also Milviz T-38A ADV at *www.milviz.com*). The aim with these products is to achieve the highest level of realism in terms of Flight Dynamics and Systems simulation overcoming the well-known FSX/P3D limitations in these aspects.

The F-4 ADV packages are designed to be used only with original Milviz F-4 aircraft. While the Milviz F-4E TacPack addon is also recommended, it is not required for using the F-4E ADV addon.

> *Note (1): some special ADV sound features will be disabled without the MV F-4E TacPack and VRS TacPack modules.*
> *Note (2): all TacPack features are natively available in the F4 J/S TP-ADV. VRS TacPack module is still needed.*

While the F-4 ADV can be considered a study simulator targeted for "hard-core" simmers (and of course, F-4 fans!), a good degree of difficulty scalability is possible. Thanks to it, the ADV version will satisfy both, those looking for the most realistic and challenging simulation experience as well as the casual flyers who don't want to deal with real-life operational emergencies that could quickly ruin his / her enjoyable (weekly) flying time… ;-)

It should be noted that this manual is designed only as *user guide* but not as ADV Flight Manual. The actual ADV Flight Manuals are:

- F4E ADV -» *TO-1F-4E-1 USAF Series F-4E aircraft Flight Manual (1979)*
- F4J/S ADV -» *NATOPS Flight Manual Navy model F-4J and F-4S aircraft (1988)*

***Important note**: specific type characteristics and/or features will be included in a dedicated note or subparagraph when applicable.*

2) ADV Features:

➢ Flight Model:

- **External Flight Physics engine**

The ADV package includes an external physics engine independent of FSX/P3D FDE. This allows highly accurate aircraft characteristics recreation (including transonic, supersonic and post-stall regions) without the traditional limitations imposed by the default simulator physics engine.

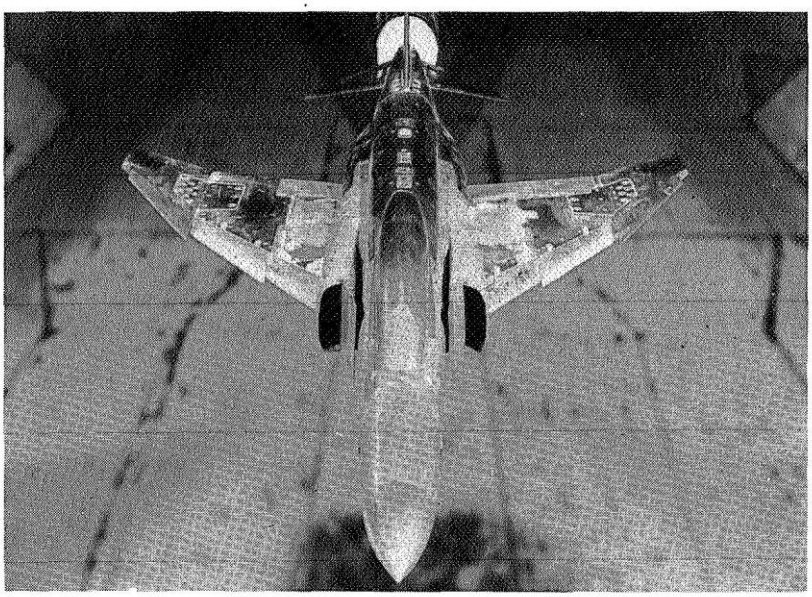
- **Aerodynamics**

Aircraft

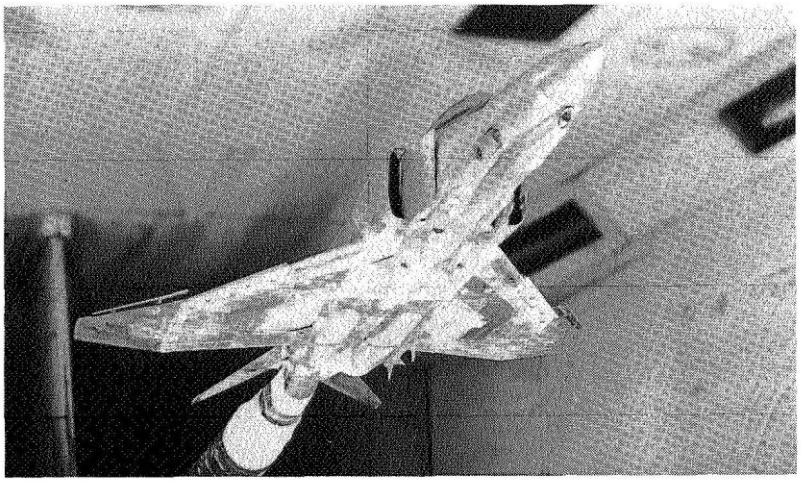
- *Stability and Control derivatives based on available Wind Tunnel and Flight Test data*:

  This is translated into realistic aircraft behaviour at all possible flight conditions.

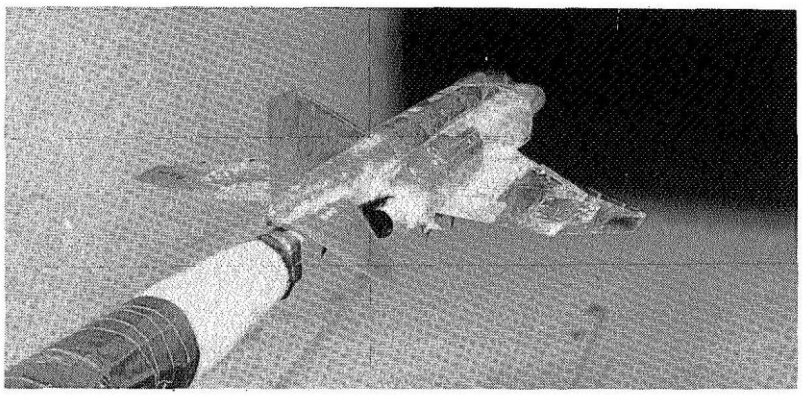
  - Angle of attack = [-180, +180]º
  - Angle of sideslip = [-90, +90]º
  - Mach = [0, +2]



(a) Top front view.



(b) Three-quarter front view.



(c) Three-quarter rear view.

- *Accurate drag model:*

  Dynamically computed aircraft parasite, induced and wave drag for all available aircraft configurations (see Stores).

- *Slats aerodynamics*: (only F-4E & F-4S)

  Realistic slats aerodynamics effects have been implemented in order to match the real jet behaviour. These effects not only affect to the aircraft lateral-directional and longitudinal stability characteristics, but also to the aircraft lift and drag characteristics and hence performance figures.

- *BLC effects*: (only F-4J)

  Realistic Boundary Layer Control effects in terms of Lift and engine thrust are included as part of the F-4J/S ADV module.

Stores

- *Accurate pylons, racks and stores drag computation*:

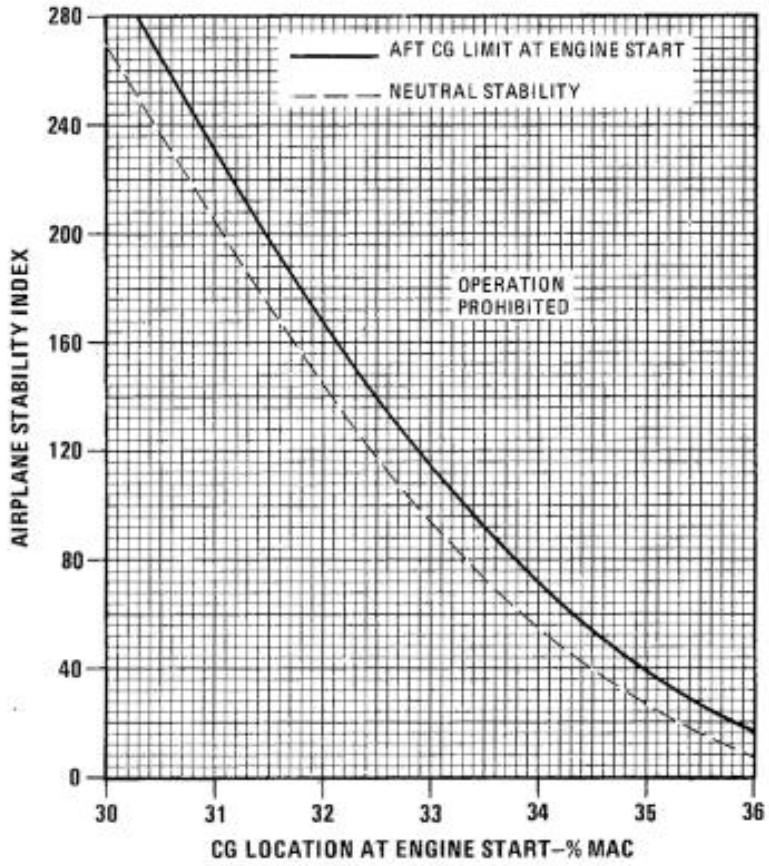
  This not only includes **parasite drag** at Mach=0, but also individual elements **wave drag** contribution as a function of Mach number.

- *Accurate pylons, racks and stores stability effects*:

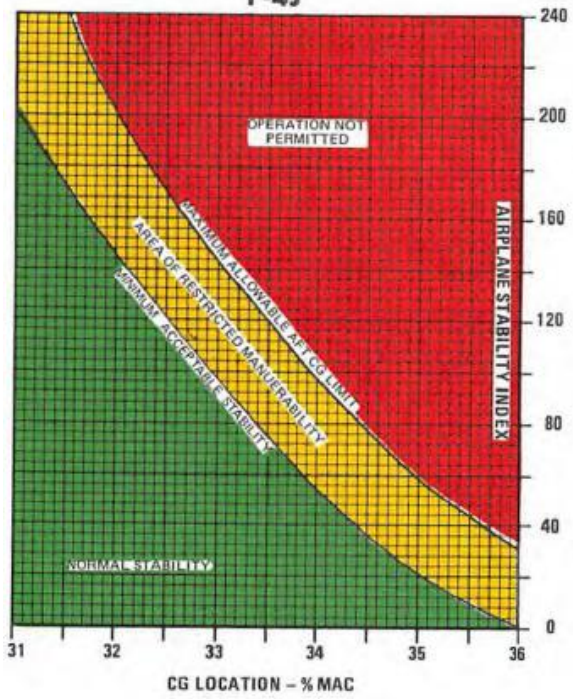
  Longitudinal and lateral-directional aerodynamic effects for each externally carried element are computed and will have impact on aircraft handling characteristics. Like in the real jet, this will be translated into operational considerations and/or limitations.

AFT CG LIMITS

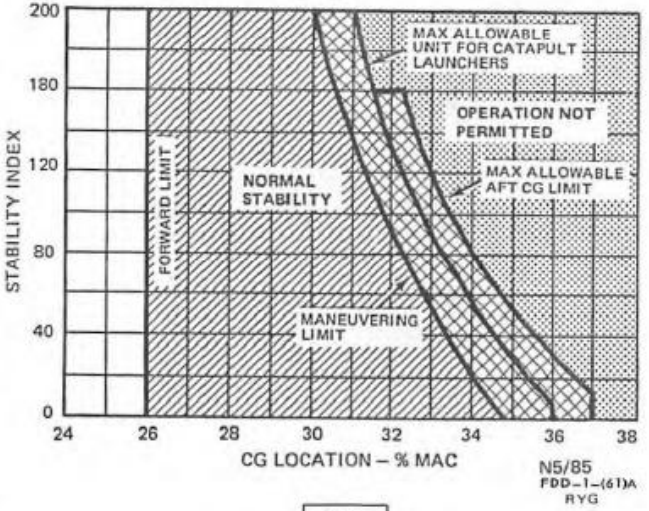
F-4E



F-4J



F-4S



Note

- With the amber area, normal flight only (angle of attack for less than buffet onset) permitted. Only slow deliberate control movements allowed.
- Although F-4S in-flight aft CG limit with zero stability index (SI) remains at 37.0 percent Mach, the aft CG limit at higher SI has shifted forward relative to the F-4J aft limit, effectively reducing the CG envelope available for wing-mounted external stores by approximately 1.0%. Permissible F-4J external store loadings may not be satisfactory for the F-4S.
- Within the amber area of the F-4S chart, flight limited to airspeeds less than 0.70 Mach and AOA less than 20 units. Only slow, deliberate, coordinated control inputs allowed.

- **Engine model**

  - *Realistic (and custom) J79 engine model (*)*:

    The ADV module not just reproduces accurate installed thrust output values (all RPM/throttle ranges) but also fuel consumption as well as engine dynamics and J79 specific characteristics. This includes engine subsystems modeling: oil system, intake ramps, exhaust nozzles, etc…

    (*) note: J79-GE-17 (F-4E)
    J79-GE-10 (F-4J/S)

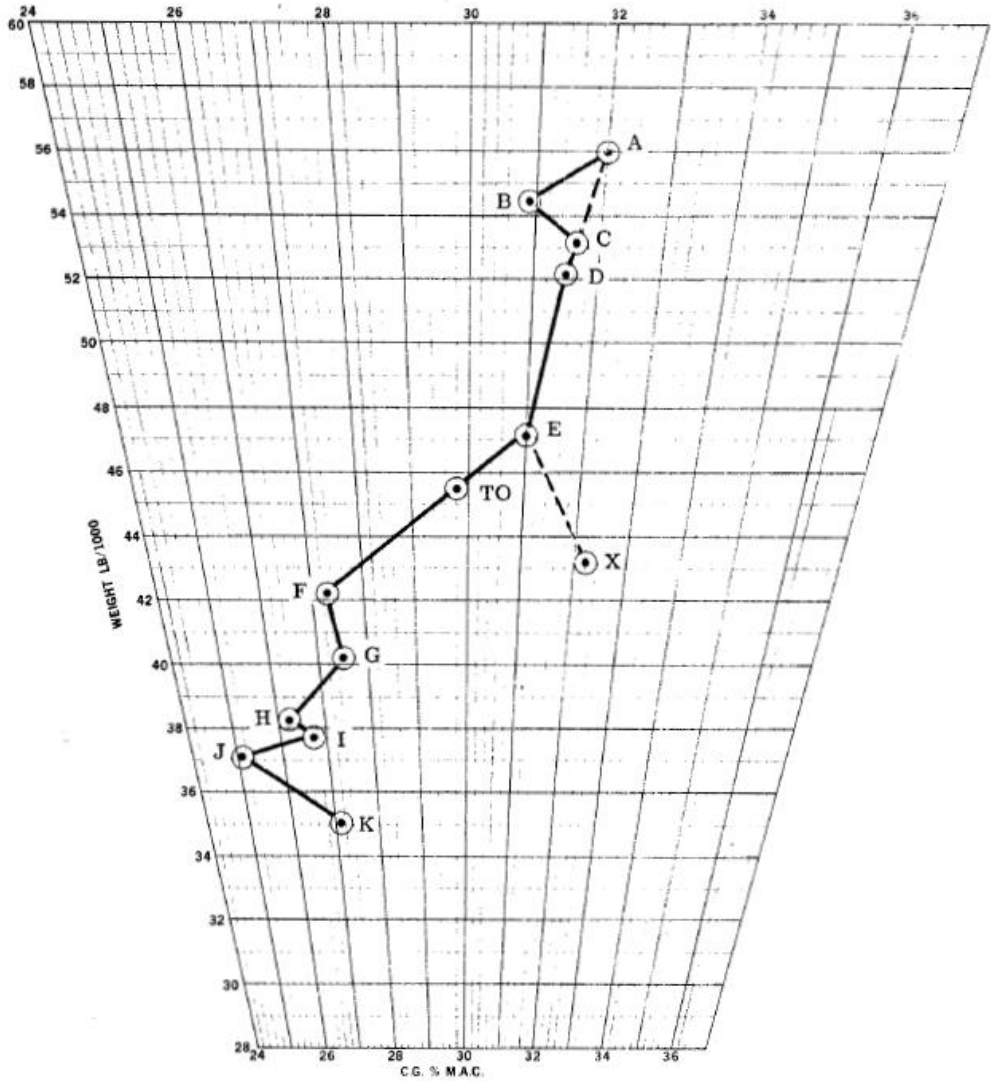
- **Inertial model**

  - *Realistic weight, inertia (MOIs) and CG model.*

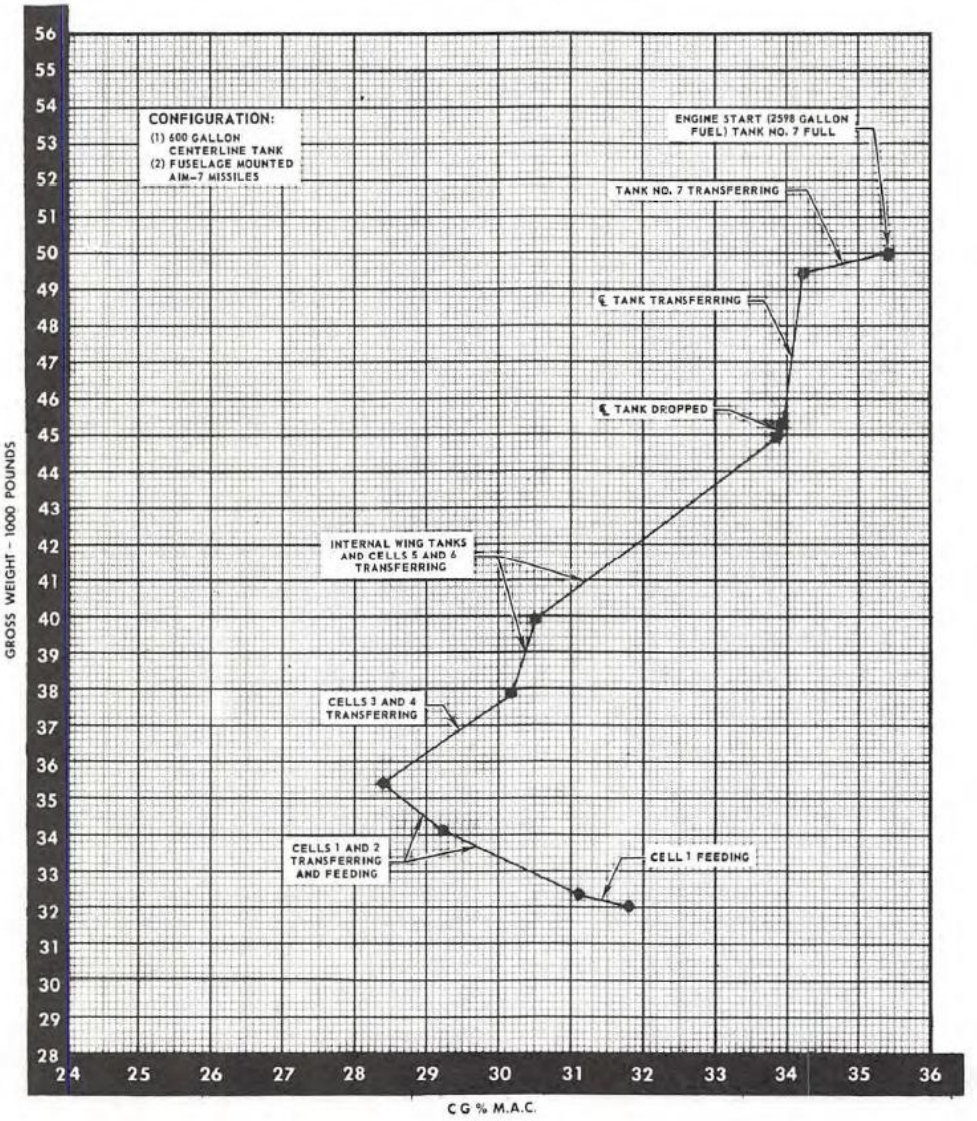
    Aircraft handling characteristics will be realistically (and dramatically) affected by stores in terms of Moments of Inertia (MOIs) and CG position. Given the F-4 Phantom particular flight characteristics, a correct CG management will need to be observed.

C.G. TRAVEL DUE TO FUEL CONSUMPTION

F-4E



F-4 J / S



- Aircraft Performance numbers

As result of the above, the F-4E & F-4J/S ADV addons model accurately match the real jet performance figures in terms of maximum speed, acceleration, manoeuvring capability (energy diagrams), range, endurance, etc... for all possible A/C configurations (see Figure 1 to 3).

Fig1: Real F-4E vs ADV model Flight Envelope

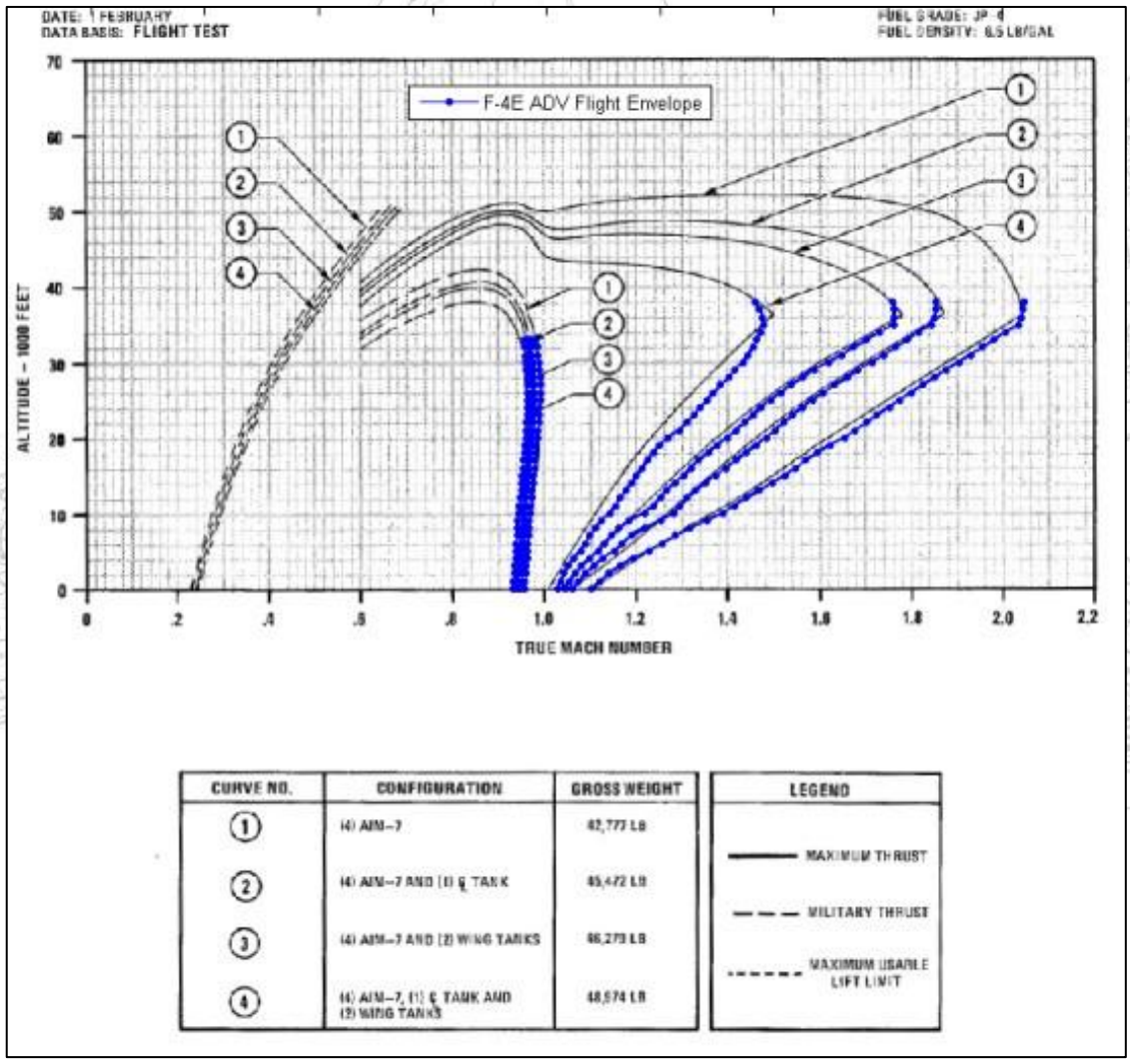


Fig2: Real F-4E vs ADV Sustained G Turn

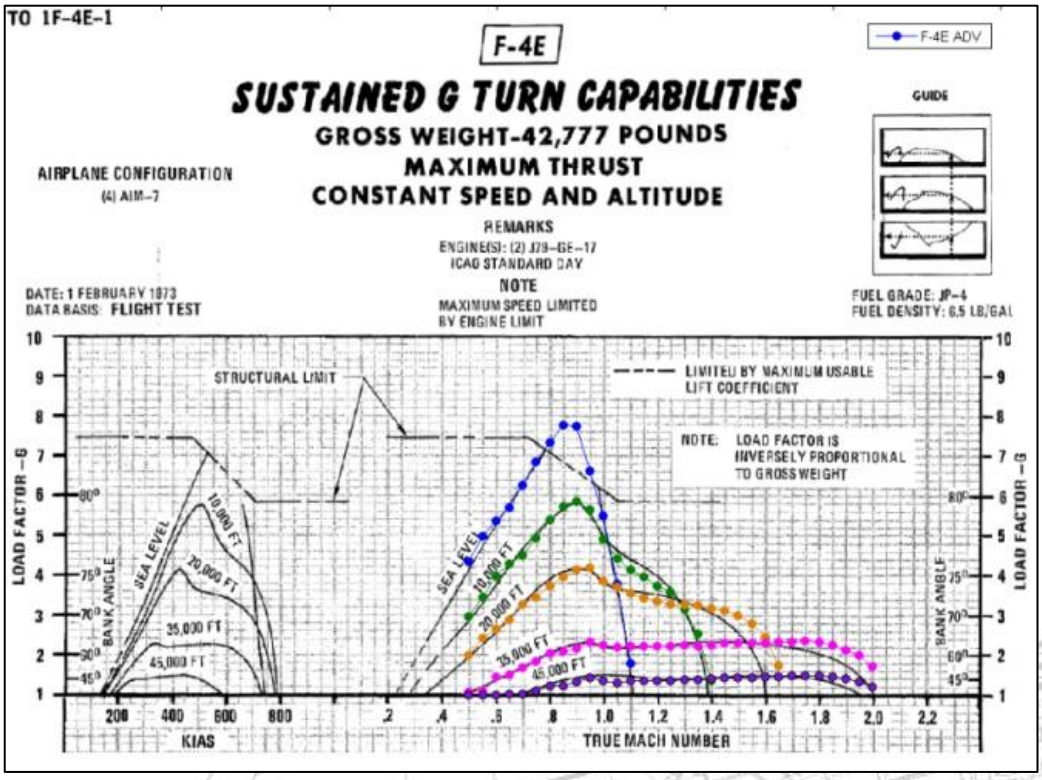
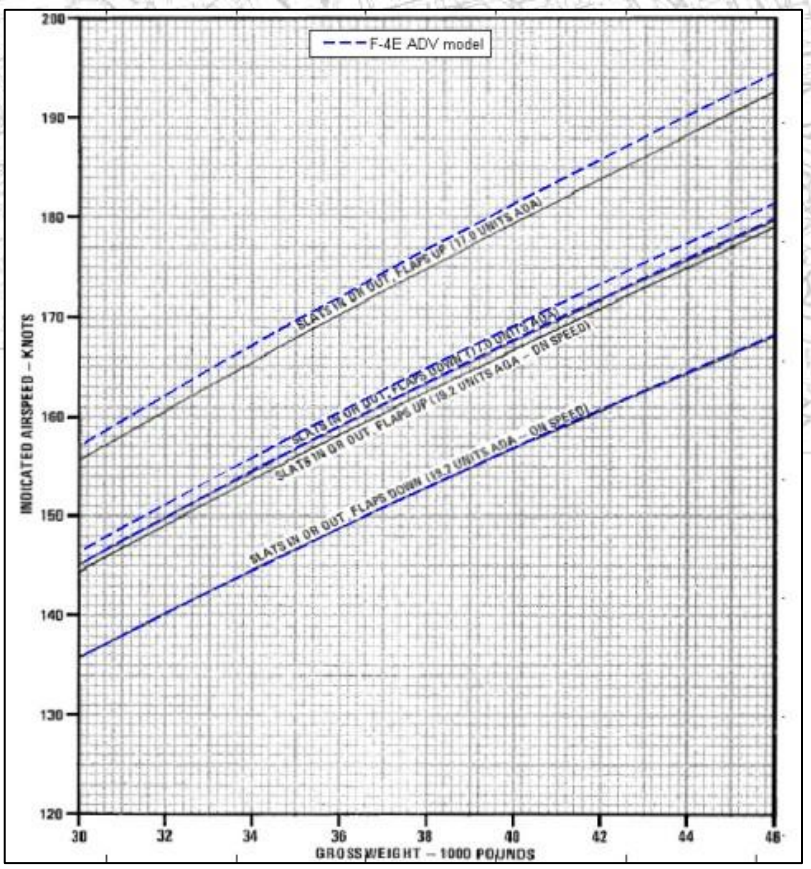


Fig3: Real F-4E vs ADV Landing Speeds



➢ Systems Model:

- ### Flight Control System (FCS / SAS):

  - *Realistic F-4 Phantom Flight Control System*:

    The ADV not only includes a 1:1 recreation of the real aircraft Stability Augmentation System (SAS - Pitch/Roll/Yaw), but also a model of the bob-weight and stick forces system (*).

    Individual control surface effects are modeled including actuators dynamics and other FCS specific elements.

    (*) note: within the limitations of non force-feedback hardware

- ### Automatic Flight Control System (AFCS):

  AFCS modes (Attitude / Altitude hold) with realistic system behaviour and limitations are implemented. It includes the Automatic Pitch Trim feature of the real aircraft.

- ### Approach Power Compensation System (APCS)* :

  A realistic APCS has been modeled according to system technical description. This includes accurate system dynamics as well as operating limitations.

  (*) note: only available for F-4J / S versions

- Hydraulics & Pneumatics systems:

  - *Aircraft individual hydraulic and pneumatic lines:*

    Each aircraft control element is realistically actuated, and this includes element redundancy and backup systems. In case of a single (or multiple) line failure, the affected system(s) will behave according to the real jet Flight Manual.

- Air Data Computer system (ADC):

  Realistic Air Data Computer (ADC) and Static Pressure Compensator (SPC) systems have been implemented. System measurement lags and inaccuracies are accurately replicated. Mach and Static Correction effects on air data system will be reflected not only in the flight instruments but also in any anemometry dependent system: AFCS, FCS, engines, etc...

- *Engines:*

  - *J79 engine operating characteristics and limitations*:

  Amongst others, the ADV includes realistic engine operating limits (for both, engine compressor and afterburner), realistic engine startup including GPU aided or Cartridge start (*), realistic engine wind milling and midair starts, realistic nozzle and inlet ramp schedules which affect engine performance and operation, etc...

  (*) note: only available for F-4E version

- *Fuel:*

  - *Realistic fuel system management*:

Both possibilities are available, **Automatic** or **Manual** (realistic) fuel management (*). In the first case, the fuel tanks will be automatically controlled resulting in a nominal defueling and nominal CG travel. The second possibility will allow the user to have full control on the fuel system management like in the real aircraft. In this case, CG limits will need to be carefully observed to keep aircraft within operating limits.

(*) note: Manual fuel management will be enabled with "Realistic Systems" option selected in the ADV Configuration Menu. Otherwise it will be Automatic.

- *Landing Gear:*

  - *Landing gear structural model (*):*

Individual landing gear elements modeled according to real aircraft structural limitations. Damage is counted separately for each landing gear strut and tire.

(*) note: F-4 J/S versions are provided with a strengthened landing gear required for carrier operations.

  - *Realistic NWS operation*

  - *Realistic anti-skid system:*

No more a "cosmetic" switch!! ☺ Additionally, brakes system performance will be realistically affected by weather conditions according to Flight Manual. Dry, wet or ice/snow runway conditions will make a big difference forcing the

pilot to check landing performance figures (flight manual) to avoid unwanted runway overrunning…

- *Drag chute:*

  - Realistic Chute dynamics effects:

The drag chute will affect aircraft dynamics in a realistic way, not only in terms of runway performance figures (drag) but also in terms of pitch, yaw and roll. The chute will become a Phantom pilot's best friend if an aircraft departure progresses beyond the initial development stage. Like in the real aircraft, it is not a 100% guaranteed anti-spin system…so, we warned.

  - Realistic Chute limitations:

Airspeed system limitations are implemented in this "only one use" per flight device, so use it wisely ;-)

Realism/Difficulty scalability:

Systems realism and limitations can be scaled from an easy/fail-free mode to the most realistic simulation experience with all the system management under pilot control.

Failures and Damage Model:

- *Random (Operational) Failures:*

Individual system failure probabilities are implemented based on real fleet data. This way, the ADV failure system generator will trigger failures reproducing realistic F-4 Phantom operational sceneries. Other damages

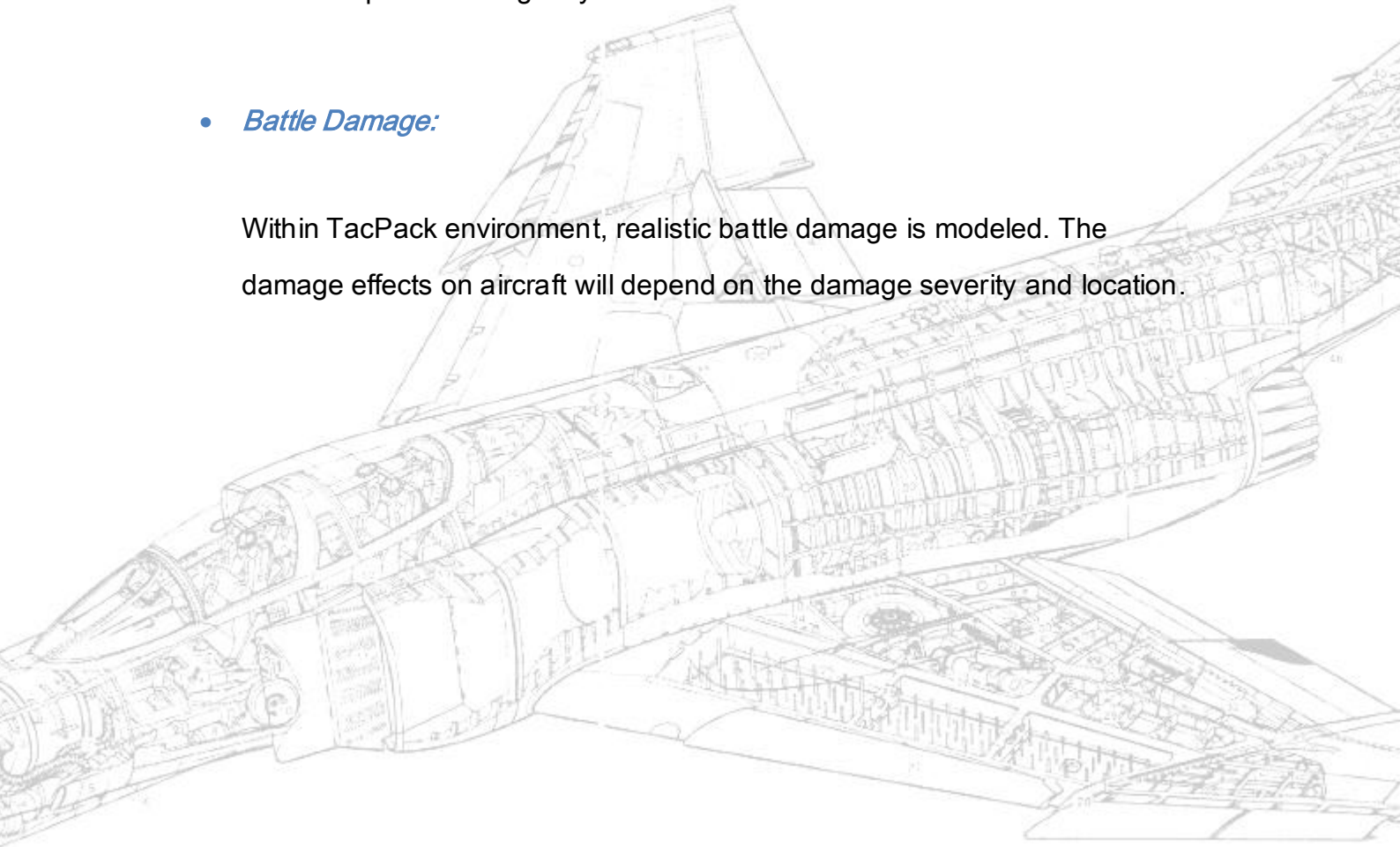
found in the real operational life like those caused by bird-strikes in the airframe or engines FODs derived from ice or birds ingestion are also implemented creating a realistic and immersive operational environment.

- *Custom Failures:*

  Single or multiple failures timed events generation is available in order to recreate specific emergency situations or sceneries.

- *Battle Damage:*

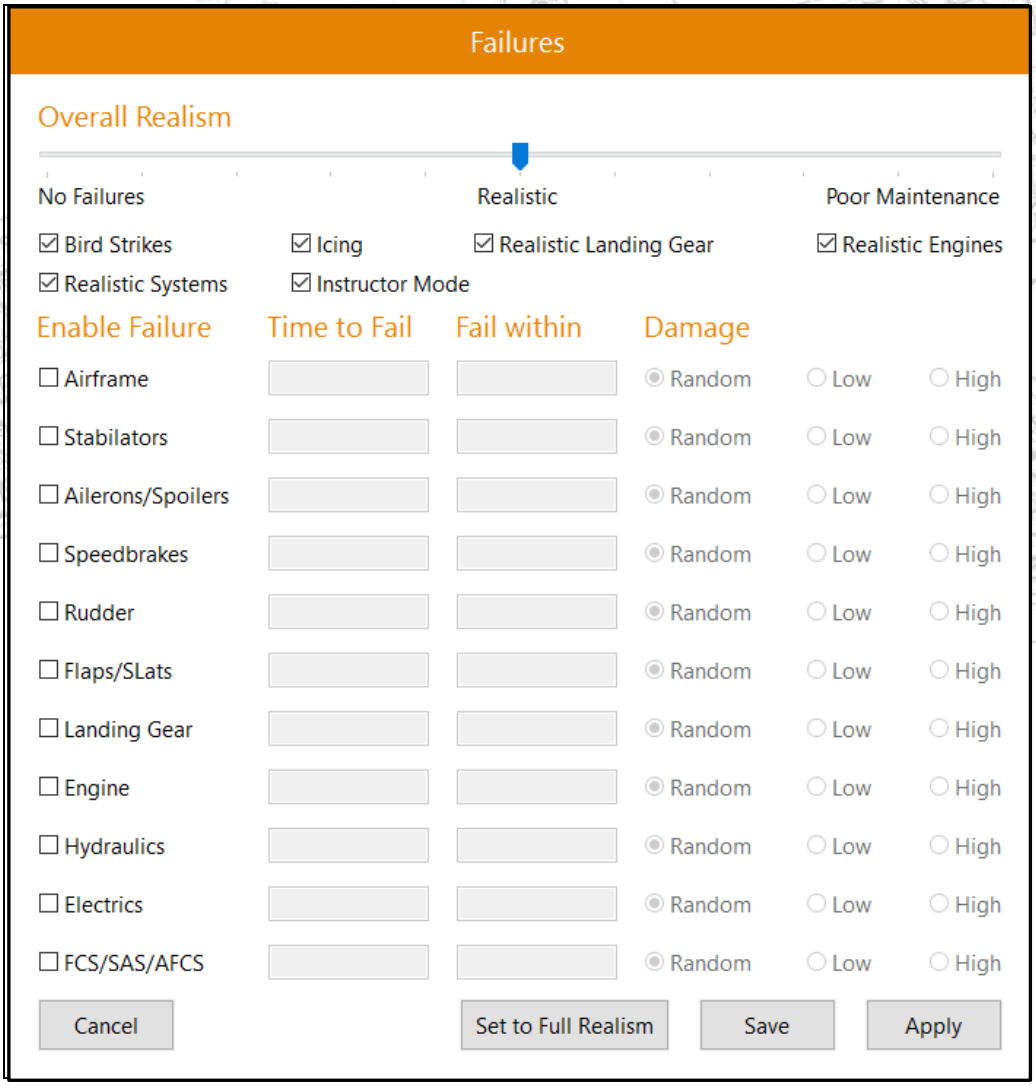
  Within TacPack environment, realistic battle damage is modeled. The damage effects on aircraft will depend on the damage severity and location.



3) ADV Failures Configuration Menu:

The ADV allows a high level of configurability depending on the taste of each user. It ranges from a semiautomatic and fail-free systems mode to a fully realistic simulation experience. This last not only includes realistic systems operation but also the possibility of having a system failure (based on real system failure rates).

Different options can be selected or not in order to obtain a desired level of difficulty from a "casual" flight, just to have fun with no other concerns beyond takeoff and landing and a hard core simulation in a realistic operating scenario.



"Overall Realism" (operational failures):

This bar sets a global factor affecting systems reliability. While each system has a realistic failure probability (failures/hour), the Overall Realism bar will modify this factor from a realistic value (middle position) to a more or less reliable level than that found in a real fleet.

This option is enabled with the bar set one tick to the right from "no Failures" (disabled).

If the bar is set all the way to the left, all operational and timed failures will be disabled.

Note I: ADV custom failures are NOT compatible with FSX/P3D default ones. Actually, both failures systems could interfere with each other causing unwanted effects or an ADV malfunction.

While unsupported, P3D/FSX failures related to A/C avionics could still be used.

Note II: even if "Realistic" position is selected, it is very unlikely to obtain failures as this bar position corresponds to a properly maintained aircraft. But of course, even in that case and like in the real operational life, failures can occur…

Note III: all individual system failures described in the Custom Failures part (see below) will be "armed" in Operational failures mode with Overall Realism bar in any position other than full left (No Failures).

Note IV: Overall Realism and timed failures are compatible. If Overall Realism is active and a system failure event is selected, the system will fail whenever happens first, either an operational failure or lapsed time for failure.

Note V: individual timed failures will be armed if the corresponding system "Enable Failure" box is ticked and either "Time to Fail" or "Fail within" (MINUTES) is filled with a value greater than 0.

(see "Custom failures explained " subparagraph, pag.20)

Realism options explained

➢ Realistic Systems:

This option enables maximum level of realism in all the systems recreated in the F-4E & J/S ADV: Oil system, Pneumatic & Hydraulics, ADC (*), RAT (**), Anti-skid, Fuel system, etc…

If this option is not selected, the systems will work in an automatic mode and/or will not cause any problem if a misuse exists. For example, you can keep inverted flight without damaging the engines until running out of fuel…

A special mention requires the fuel system. If "Realistic Systems" is selected, the automatic fuel management will be disengaged. The pilot will need to deal with the fuel switches/valves to get a correct defueling depending on the aircraft configuration. An incorrect fuel management could lead to dangerous CG positions affecting aircraft handling characteristics.

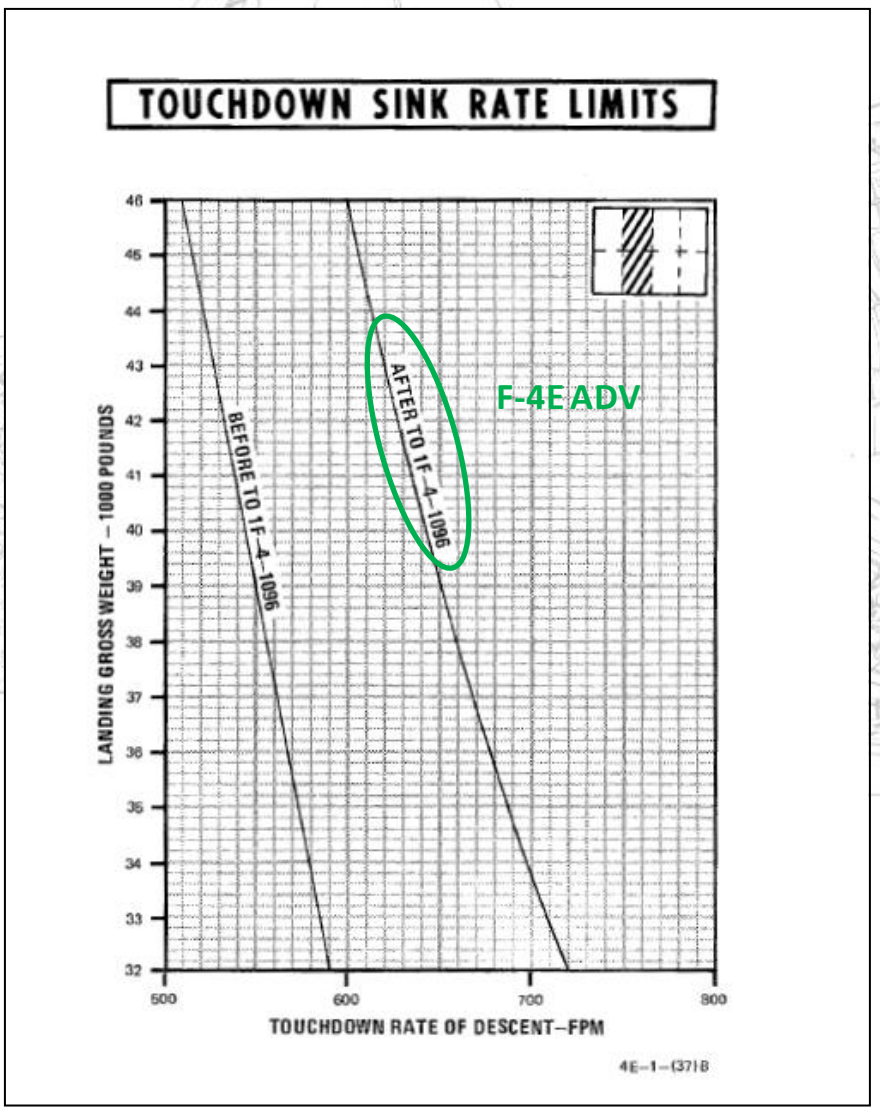
(*) note: If "Realistic Systems" option is disabled calibrated air data will be shown and ADC system lags will be also disabled.

(**) note: only available for F-4J/S

➢ Realistic Landing Gear:

This option enables the ADV landing gear model. The ADV is provided with a custom landing gear physics model that accounts for structural limitations. Landing gear struts or tires can be partially or totally damaged depending on the situation and the element overstress.

Note: "Detect crashes and damage" and "Aircraft stress causes damage" options must be enabled in the FSX/P3D Realism menu to get this ADV feature working correctly.



➢ Realistic Engines:

This option enables the maximum realism level for engines and engine sub-systems. With it selected, J-79 engine operating limitations will need to be observed in order to avoid compressor stalls or engine flame-outs.

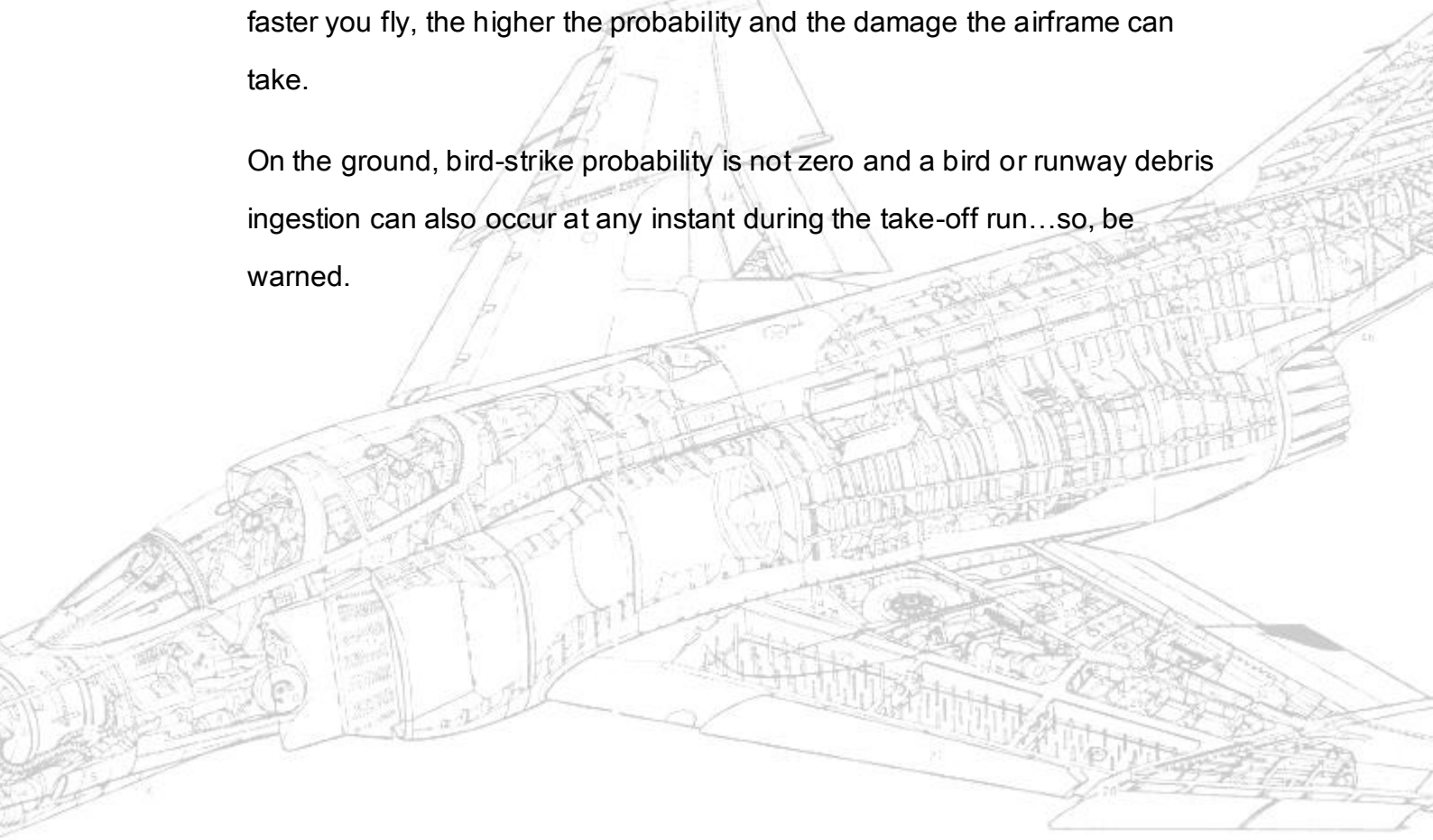
Additionally, other systems directly related to engine operation like variable exhaust nozzles, inlet ramps or oil supply will be affected and/or will affect the engine or any related aircraft system in a realistic way and according to the Flight Manual.

➢ Birdstrikes:

This option enables the possibility of midair collisions with birds. The impact can affect the airframe or the engines, being the damage severity dependent on the energy of the collision (bird weight and aircraft speed).

The probability of having such unwanted “encounters” is based on data gathered by USAF in several studies. As a rule of thumb, the lower and the faster you fly, the higher the probability and the damage the airframe can take.

On the ground, bird-strike probability is not zero and a bird or runway debris ingestion can also occur at any instant during the take-off run…so, be warned.



➢ Icing:

This option enables the effects on the most important systems affected by ice accruement in the F-4 aircraft, basically: engines and flight control system. Depending on ice accruement on airframe, aircraft performance could also be impacted.

If icing conditions are met (subsonic/transonic flight) and the anti-ice system is OFF (or failed), the ice will start accruing on different parts of the engines intakes, struts, hubs…In this case, the higher the amount of ice, the higher the probability of being detached and ingested by compressor and the higher the damage it can cause to the engine. In addition, ice accruement will affect engine performance and will make the compressor more susceptible to stalls.

Aside, if the pitot heater system is OFF (or failed) and icing conditions exists, ice will start accumulating on the stabilators bellows ram-air inlet probes causing restrictions of airflow in these units. This will be translated into a progressive aircraft nose-down tendency. The activation of the pitot heaters or exiting icing conditions will progressively reverse this effect.

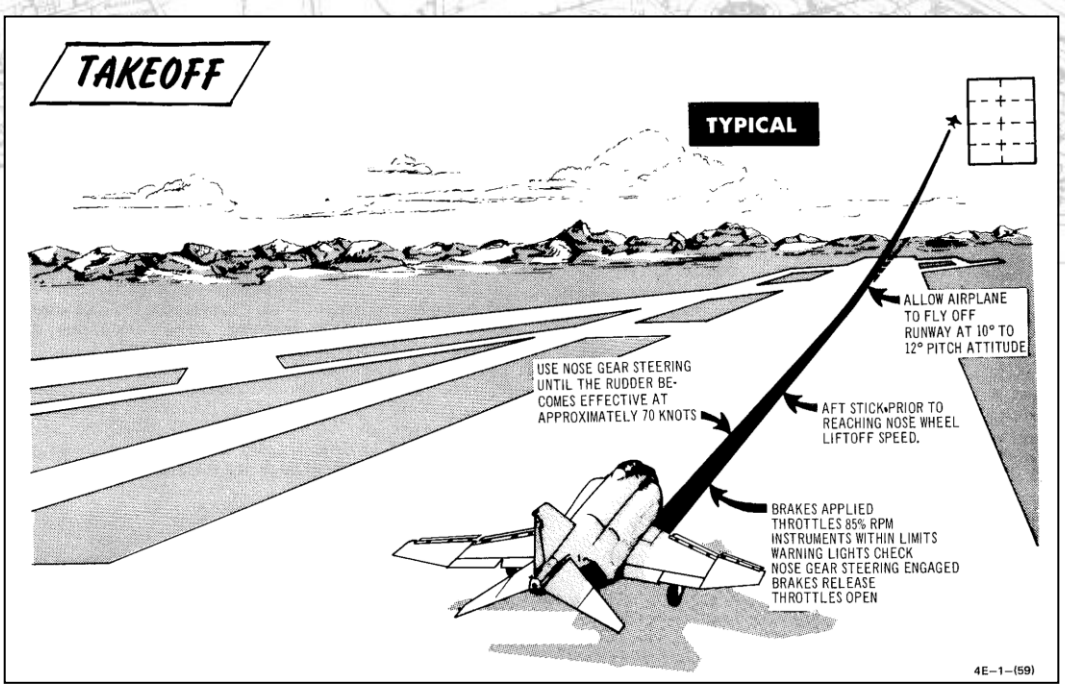
➢ Instructor mode:

Given the F-4 ADV complexity, an “Instructor mode” has been implemented. It can be selected to help at any flight phase ranging from the engines start to engines shut-down.

In this mode, aircraft configuration changes, operative limitations, miss-operation warnings, limitations exceedances, failures, damages or just flying hints will be displayed like if a real F-4 instructor were in your rear seat. This will make things easier, especially if the maximum realism is selected and the flying hours in this type are few...

> *Note: the use of the instructor mode is highly recommended during the familiarization period. This option will help (A LOT) with the learning curve and will always give the pilot a quite valuable info on what’s going, especially when / if things turn ugly.*

Also it could show you that there’s a chapter in the flight manual that needs a more carefully reading before running to post a possible problem in the support forum… ;-)



Custom failures explained:

➢ "Time to fail" vs "Fail Within":

Additionally, failures can be triggered in two modes: "Time to fail" and "Fail Within". In the first case, the failure will occur *after* the selected time lapse (in minutes). In the second case, it will occur at any time *within* the selected time lapse (in minutes).

➢ "Damage" option:

This option can take three values: random, low or high. In the first case (random) the failure severity will be randomly obtained, ranging from a minor or even negligible damage to a total system loss. Obviously, the other two options (low, high) will force just a minor/degraded or a total system failure respectively once the failure is triggered.

System failures description:

- Airframe: includes fuselage, empennage and wings elements. This failure reflects non-catastrophic structural failures caused by a small skin delamination and/or out-of-rig conditions leading to small flight asymmetries.

- Stabilators: both stabilators. This option ranges from a small stabilator misalignment to the total loss of the hydraulic actuators.

  Note: (only) in the F-4E there is a backup system (APU) electrically operated that will make it very unlikely the total loss of the pitch control.

- Ailerons/spoilers: partial or total actuators loss (or control surface jammed) in either ailerons or spoilers.

- Speedbrakes: partial or total control loss of the airbrakes. In the case of airbrakes lost in extended position, increasing dynamic pressure will make them to get retracted (if system not jammed).

- Rudder: partial or total control loss of the rudder.

- Flaps/Slats (*): partial or total control loss in either slat or flap. After the failure, asymmetric (splitted) flaps/slats configurations could result.

  (*) note: In the F-4J (F-4J/S TP-ADV) this failure can affect to Boundary Layer Control (BLC) system instead of Slats.

- Landing Gear: partial or total loss in the landing gear extension or retraction capability. It can affect to one or the three landing gear legs. If available, emergency pneumatic extraction can be attempted after failure.

- Engine: left or right aircraft engine damage. From a minor or even unnoticeable (for pilot) damage to a total engine loss that could be accompanied with fire…

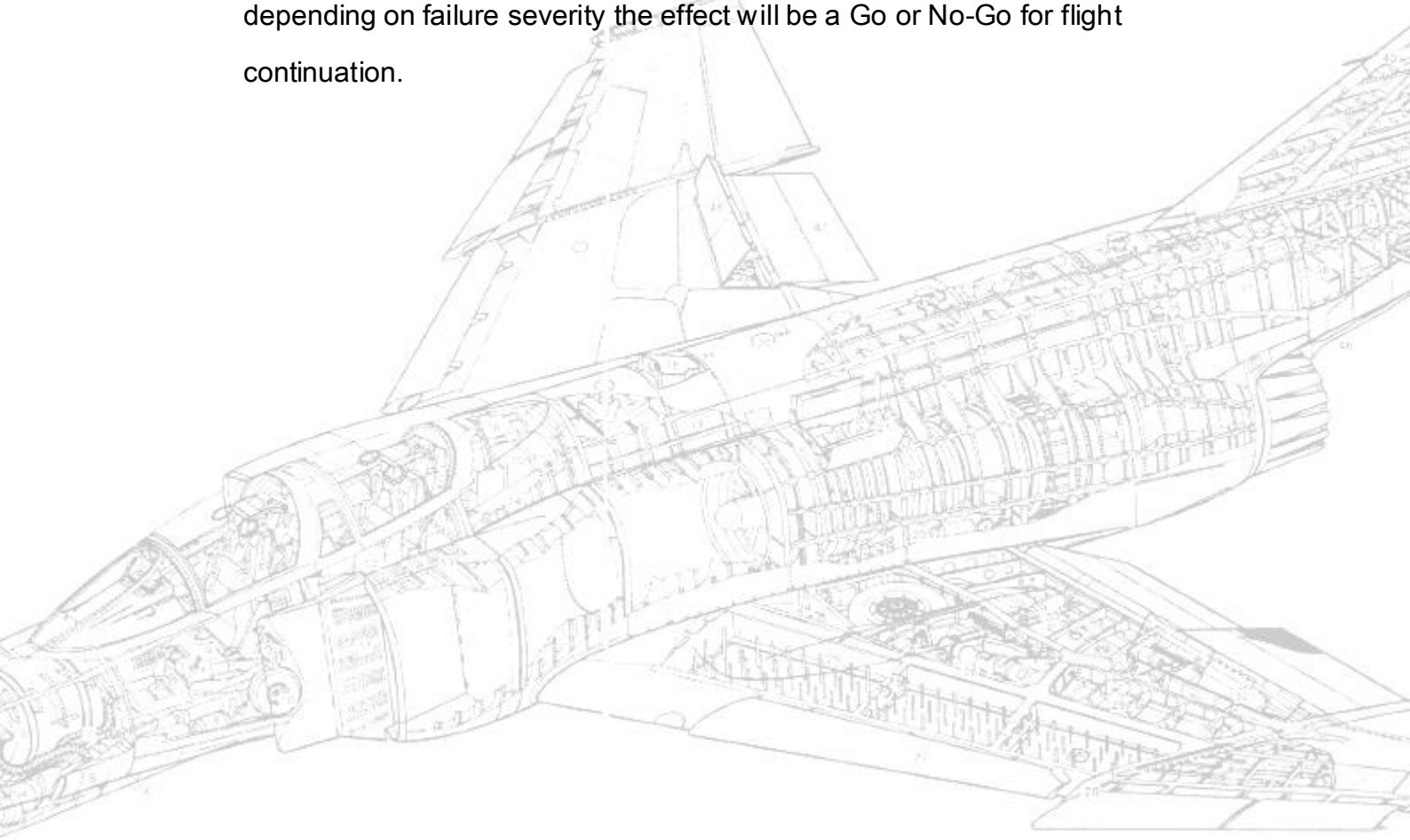
- Hydraulics: failures in each of the hydraulic system lines: PC1, 2 or Utility. The failure severity can range from a hydraulic pump partial or total loss to a hydraulic line leakage.

- Electrics: This failure affects right and left engines AC and DC buses (Main and Essential) as well as the AC or DC Bus Tie. A partial or a total electric generator fail can occur with all the possible combinations in between.

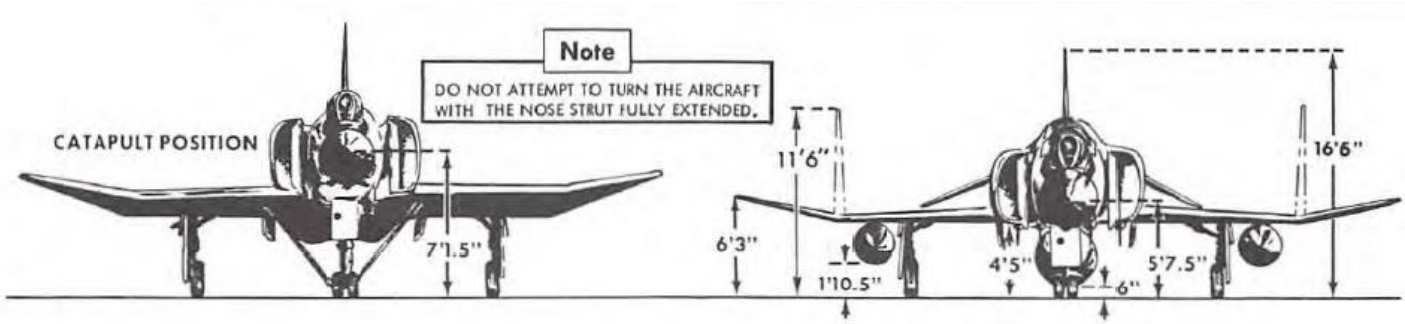
  Note (1): battery failure is not modeled for the F-4E, so it's very unlikely to have a total electrical system failure.

Note (2): Ram Air Turbine (RAT) will need to be used in the F-4J / S if both generators are offline to avoid a total loss of electric power. RAT is deployed/retracted with FSX/P3D " APU / Generator (toggle) " command.

- FCS / SAS / AFCS: A wide variety of failures related to flight controls can occur with this option: stab bellows partial or total failure, pitch trim runways, single or multiple channel SAS failures, Autopilot failure, etc…Again, depending on failure severity the effect will be a Go or No-Go for flight continuation.



4) Carrier Ops: (F-4J/S ADV addon only)



The F4-J/S ADV module is provided with a custom carrier dynamics engine.

This ADV's enhanced carrier physics is mainly focused on two parts:

- Catapult System
- Arrestor Gear System

In both cases, the specific system limitations in terms of pneumatic power, mechanical resistance, etc… are considered allowing realistic carrier operations.

➢ Catapult System

The ADV's carrier physics will automatically compute the required aircraft launch 'end-speed' (*) based on:

- WoD (Wind Over Deck)
- Aircraft weight
- Flaps configuration
- Engines setting (MIL / AB).

(*) note: The 'end-speed' value is not included in the F-4J/S NATOPS manual. It has been calculated based on the ADV a/c performance model and according to the "ES" definition.

The required catapult power setting will be computed once the aircraft is placed in the catapult position. Engines must be stabilized 2-3 seconds in either MIL or Max AB before proceeding to the cat launch. The same requirement applies to aircraft carrier speed (WoD).

The catapult stroke power will be auto-configured to get the required 'Minimum End Speed **+ 10kts'** (*) for each aircraft configuration. This incremental speed (+10 kts) is applied –like in the real life- as an operational safety margin which accounts for wind gusts, catapult power losses and/or possible engine failures, amongst others.

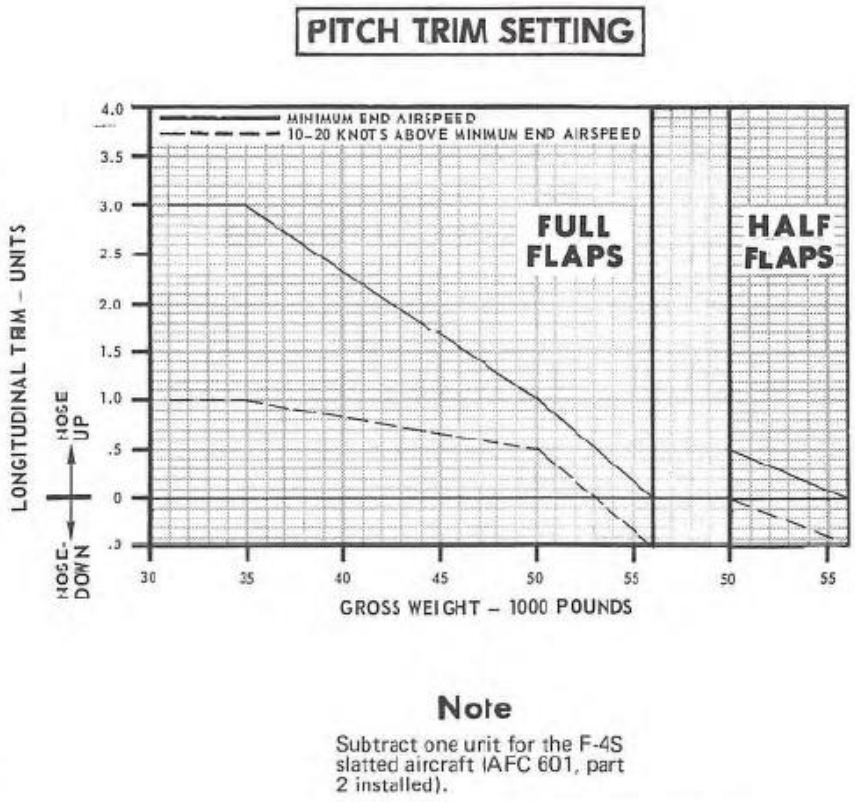
> (*) note: As a rule of thumb, the 'ES' for Full-Flaps configuration is approximately 10 kts lower than the nominal runway take-off speed and 10kts greater for Half-Flaps catapult launches.

Aircraft configuration (flaps + engines power) must be "frozen" just before and during the catapult stroke. Otherwise, the stroke power applied could not be enough to attain the calculated end-speed causing an excessive sink rate or even an aircraft stall at the end of the launch run.

Incorrect/out-of-limits aircraft configurations could result in a failed catapult launch with disastrous consequences…

POWER AND FLAP SETTINGS

A/C GROSS WT – LBS	POWER SETTING	AMBIENT AIR TEMPERATURE DEGREES F	FLAP SETTING
BELOW 50,000	MRT	ALL	FULL
	MAX A/B	ALL	HALF OR FULL
AT 50,000	MRT	70 OR BELOW	FULL
	MRT	ALL	HALF
	MAX A/B	ALL	HALF OR FULL
ABOVE 50,000	MRT	ALL	HALF
	MAX A/B	ALL	HALF OR FULL



➢ Arrestor Gear System

The F-4J/S ADV module includes a realistic model of a typical US carrier arrestor gear system (Mk7 series). This means that the maximum energy that the arrestor gear can absorb is limited to about $40x10^6$ ft-lb. Cable is also mechanically limited to a maximum impact speed (a/c tail-hook) of about 160kts.

In practical terms this means that, as happens in the real life, landing an aircraft on a carrier deck is a challenging task that involves additional constrains that needs to be observed.

From both limitations (maximum energy absorption and impact speed) the aircraft weight and landing speed will need to be considered before attempting to land. For example, if the landing speed for a given a/c configuration is near the **cable speed limit** (**160kts**), the carrier will need to increase its forward speed for the recovery. Please,

note that the actual impact speed is the aircraft-carrier relative speed. So, if the landing speed is 156kts (near the limit…) and the carrier is moving fwd at 30kts, the relative speed would be 'reduced' to 126kts approx., which is far from cable speed limitation. Additionally, this will –considerably- reduce the total amount of energy the arrestor gear will need to absorb!.

As a rule of thumb, the heavier the aircraft the higher the carrier speed needed. Obviously, attempting to land beyond maximum landing weight /speed is the best way to collapse the landing gear, break the arrestor cable,… ending the flight with a dip.

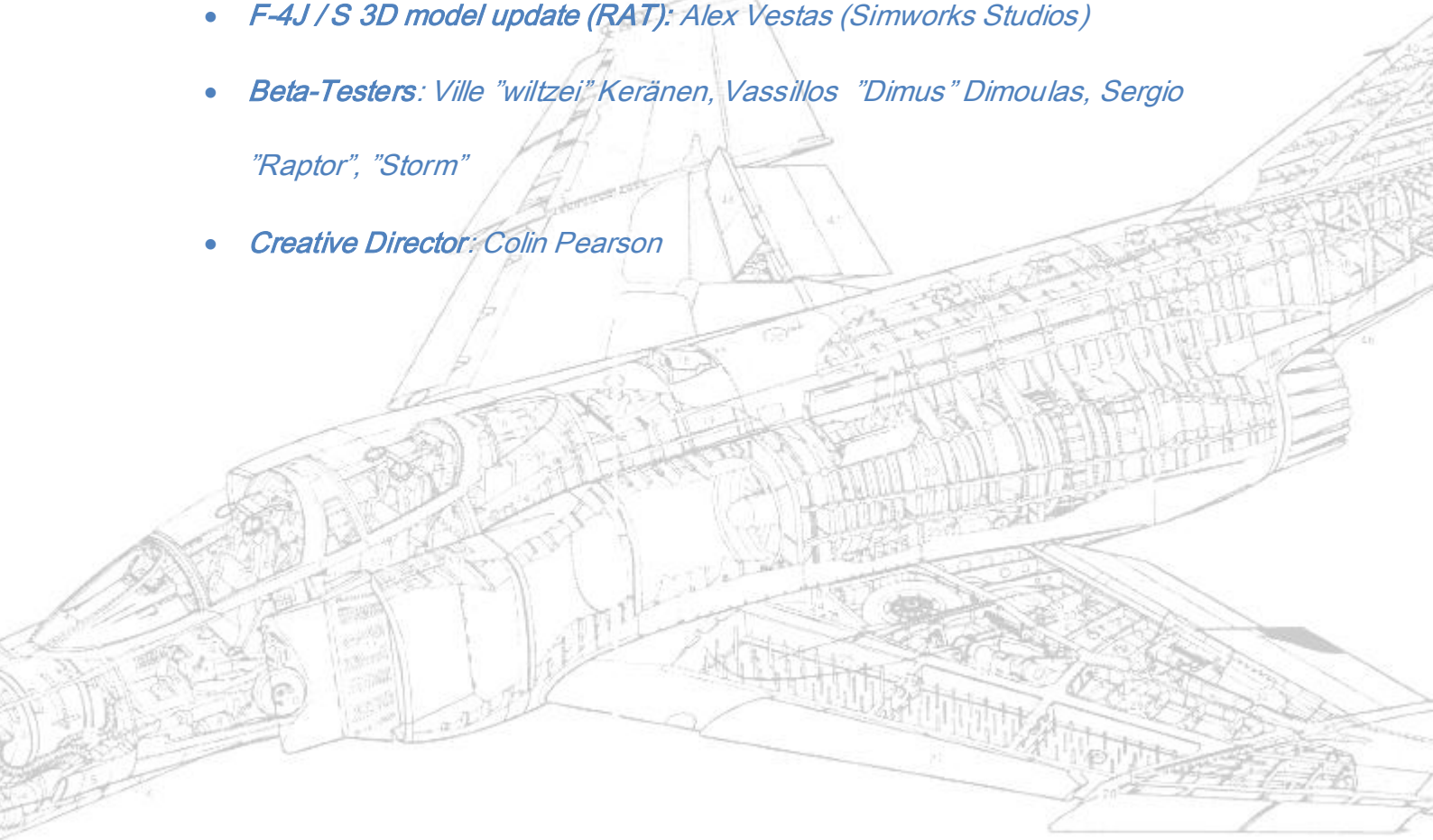
5) Bibliography:

- ***TO 1F-4E-1, 1979*** *"USAF Series F-4E aircraft Flight Manual"*
- ***NAVAIR 01-245FDD-1, 1988*** *"NATOPS Flight Manual Navy model F-4J and F-4S aircraft"*
- ***NASA CR-2144****, "Aircraft Handling Qualities Data"*
- ***AFFDLTR73-125****, "Identification and correlation of the F-4E stall/post-stall aerodynamic Stability and Control characteristics from existing Test Data"*
- ***NASA TN D-6091****, "Dynamic Stability Derivatives of a Twin-Jet Fighter Model for Angles of Attack from -10° to 110°"*
- ***NASA TN D-5361****, "Analysis of Lateral-Directional Stability Characteristics of a Twin-Jet fighter Airplane at High Angles of Attack"*
- ***AD859798****, "Stability and Control Derivatives for the F-4E Aircraft"*
- ***AD876862****, "Stall/Near Stall investigation of the F-4E Aircraft"*
- ***NASA TN D-6921****, "Subsonic Characteristics of a Twin-Jet Swept-Wing Fighter Model with Maneuvering Devices"*
- ***NASA TM X-2325****, "Subsonic Characteristics of a Twin-Jet Swept-Wing Fighter Model with Leading-Edge Krueger Flaps"*
- ***AD-A256 438****, "Wing-Rock Prediction Method for High Performance Fighter Aircraft"*
- ***MIL-STD-2066 (AS),*** *"Catapulting and arresting gear forcing functions for aircraft structural design"*

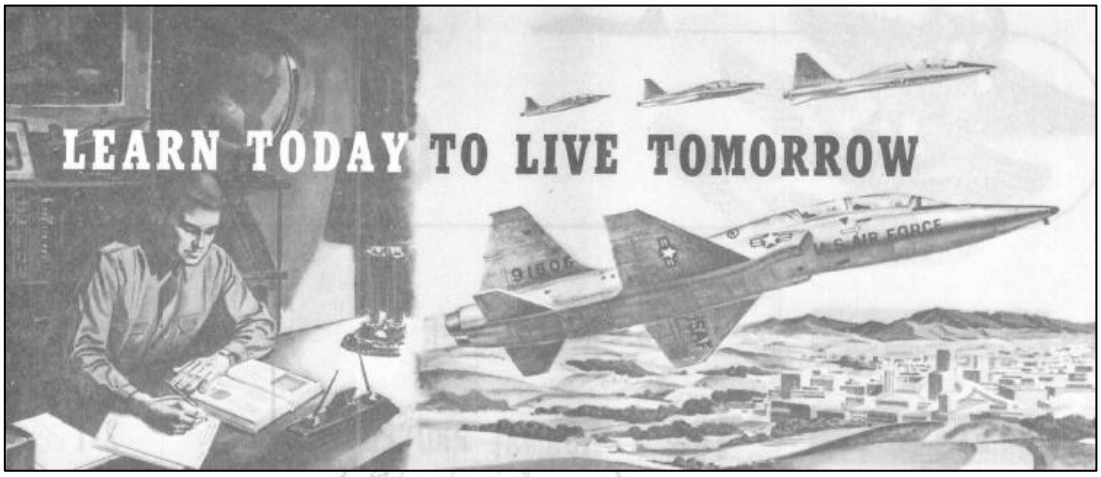
And many more!…☺

6) Credits:

- ***F-4E / J / S ADV developer / coder**: Álvaro Castellanos*
- ***ADV integration support coder**: Jonathan Bleeker*
- ***F-4E / J / S ADV manual**: Álvaro Castellanos*
- ***Pilot / Project consultant**: Torsten "Alpha" Ahlf*
- ***F-4J / S 3D model update (RAT):** Alex Vestas (Simworks Studios)*
- ***Beta-Testers**: Ville "wiltzei" Keränen, Vassillos "Dimus" Dimoulas, Sergio "Raptor", "Storm"*
- ***Creative Director**: Colin Pearson*



7) FAQs:



1) Do I need to read the TO-1 / NATOPS aircraft manual to use the ADV?:

- ✓ Yes and No… ☺
- ✓ The TO-1 / NATOPS (and the ADV Manual) should be consulted / checked before running to post an issue in the support forums. While a complete reading of the TO-1 / NATOPS is recommended for those using the ADV at maximum realism level, a quick look at the manual on general a/c characteristics or systems description would be welcome to understand some of the ADV features and differences with the basic MV´s F-4 aircraft.

2) I get slightly different Drag Index or Weight values from "Instructor Mode" than those shown in the Payload Menu. Which is correct?:

- ✓ A more accurate ADV aircraft configuration will be shown in the Instructor Mode. Additional important aircraft configuration parameters as Center of Gravity (CG) and Stability Index (SI) will be displayed in the Instructor Mode.

3) Why does the rudder move without Utility Hydraulic power?:

- ✓ Because pedals movement is transmitted by the push-pull rods, bellcranks and cable assemblies to the control valve of the rudder power cylinder. Fluid is allowed to pass from one side to another of the cylinder if Utility Hydraulic Pressure is lost.

✓ Total amount of rudder deflection available in this situation is a function of air loads on the rudder.

4) I can't start engines using Ground Power Unit, help!:

✓ The following procedure must be followed:

1) GPU ON (MV Payload Menu <Shift +1>)
2) Engines 1 & 2 Master ON
3) L & R GEN to "EXT" position
4) Click on "Signal External Airflow" (Add-ons-> Milviz F-4 Phantom II), then the GPU air generator will start to spool-up. Wait until rpm stabilized.
5) Engine Start switch moved to "R". This opens the right engine air inlet valve allowing the GPU airflow reaching the engine (ground crew synchronized action).
6) At RPM>10% throttle Right advanced to Idle while pressing Right Throttle Ignitor button (if mapped, otherwise it will be automatic).

Repeat 5-6 for the Left engine.

5) The engines always catch fire during GPU start!:

✓ That's because throttles are advanced to idle position too soon (engine RPM<10%). Fuel starts to be injected in the combustion chamber and unburned fuel accumulates flooding the chamber. In this condition, the probabilities of having an engine fire (with a spectacular ball of fire) upon fuel ignition are high.

Note 1: during Cartridge starts the throttle must be advanced to idle upon cartridge ignition. (RPM=0%)

Note 2: after a failed/aborted engine start it takes about 1-2 minutes to drain excess fuel. An immediate attempt to start the engine that does not observe the drainage period could cause an engine fire or a hot start.

6) *I not always get a successful "cartridge" engine start: (Only F-4E)*

- ✓ Cartridge start is a quite "rude" and unreliable jet engines start technique... Faulty cartridge pyrotechnics, electric ignition or just moisture can result in a cartridge misfire or hung. Once faulty cartridge exhausted and low engine RPMs achieved, the faulty cartridge will be replaced by the ground crew.

- ✓ Approximately a 10-20% of the engine start attempts using this technique will fail due to above mentioned issues.

7) *The "cartridge" failed or is hung…and now, what?!: (Only F-4E)*

- ✓ Wait. Once the cartridge has failed, the ground crew will automatically proceed to replace it. In order to avoid a prolonged (but realistic) wait, the replacement sequence will only take 1 minute approximately after the affected engine stops.

  Note : pilot's missed cart-start attempts (not faulty cartridge caused) will require an aircraft reload for cartridge replacement. GPU aided starts still will be available in those cases.

8) *How can I extinguish the "STATIC CORR OFF" warning light after engine start?:*

- ✓ Easy, by moving the CDAC switch to RESET CORR position. The SPC must be reset after the engines have been started prior to each flight. This includes any in-flight complete electrical AC shutdown.

9) *My tires burst every time I use the brakes!!:*

- ✓ Use the anti-skid!. :-)
- ✓ A full brakes application (typically in FSX/P3Dif not using dedicated pedal hardware) without the Anti-Skid active will cause the main wheels to block.

Depending on speed, tires will be quickly degraded due to friction and resulting high temperatures while blocked.

10) My tires explode every time I land!!:

- ✓ Landing beyond maximum weight limits, with a high sink-rate and at high airspeed (high energy landing) is the perfect combination to have, at the very least, a tire blow-up. Doing it under heavy crosswinds (one leg touch down) is a perfect situation for an additional landing gear strut collapse.

11) The aircraft exhibits a strong nose-up tendency after take-off:

- ✓ For a "clean" configuration (CG ≥ 32% MAC) the "slatted" aircraft needs 2-3 units of Nose Down trim. This will result into an almost "hands-off" trim condition upon landing gear and flaps retraction (notionally, 200kcas). Increasing airspeeds will require additional nose-down trim. Of course, once the aircraft trimmed, the opposite is also true.

12) The aircraft suddenly or progressively exhibits out of trim tendencies (pitch up or down) despite my trim inputs:

1) Check trim position as it could be caused by a trim runaway or trim failure. If this is the case land as soon as possible following emergency procedures.

2) Activate Pitot Anti-ice as stabilators bellows probe could be obstructed by ice or water. The Pitot Anti-ice should solve this problem and a normal flight condition should be recovered.

13) Why does the aircraft start to exhibit out of trim tendencies in roll and/or yaw?:

- ✓ There are several causes for it, going from control surfaces rigging to small fuselage damages/imperfections, ice accruement (if icing conditions are met), birdstrikes (airframe damage) or just Auto-pilot induced asymmetries. In most cases, the roll/yaw tendency can be easily trimmed out.

14) The engine RPMs and/or EGT starts fluctuating, what's going on?!

- ✓ The engine has been damaged (FOD, blade detachment, ice ingestion, etc…). Depending on damage severity, the engine will keep running or will start degrading progressively until a complete fail and shut-down happens…keeping the engine running could lead to an engine fire.

Note: with heavy damage, the engine will flameout or get completely destroyed. In these cases, the engine surely can't be restarted (fortunately).

15) I get asymmetric nozzle positions and EGT readings

- ✓ Check Oil pressures.
- ✓ Variable Exhaust Nozzle (VEN) positions are operated by the Oil System. Depending on the condition, an incorrect VEN position will lead to EGT over-temperatures or thrust losses.

Note: if an oil system leak exists, the engine shut-down should be considered. Oil starvation is the engine shaft´s worst enemy and a having complete engine failure is just a matter of time.

16) I get low levels of thrust and/or abnormal EGT values

1) Check Utility Hydraulic Pressure.
   Variable Duct Ramps are operated by the Utility Hydraulic System. A total loss of the Utility HYD pressure will cause the ramps get stuck at a fixed position. Depending on the deviation over the scheduled position, an engine thrust loss or compressor instabilities will be found.

2) If icing conditions are met set engines Anti-Ice ON.
   Under icing conditions, ice accruement in the intakes, struts, hubs… will cause airflow distortions and some degree of mass flow blockage. Aside of the dangerous FOD possibility, engine performance will be affected.

17) I used the drag chute and jettisoned it, but it seems to be retracted in the aircraft. Can I use it again?

✓ No, that's a 3D model animation limitation.

Instead of being physically detached, the chute will be apparently "retracted" in the aircraft again.

✓ As stated previously in the manual, the Drag Chute can be used only once per flight.

18) I have ADV "Realistic Landing Gear" option enabled but I don't see any landing gear damage or experience strange behaviours after very hard landings

✓ Make sure "Detect crashes and damage" and "Aircraft stress causes damage" are enabled in the FSX/P3D Realism menu to get this ADV feature working correctly.

Note: TacPack automatically disables these options in the sim Realism Configuration menu. Check them once your flight is loaded.

(F-4J/S ADV only)

19) How can Ram Air Turbine (RAT) extension/retraction command be defined in the AMS?

- ✓ **RAT command cannot be defined in the MVAMS**.
- ✓ RAT must be defined in FSX/P3D menu using "*APU / Generator (toggle)*" command.

20) The aircraft 'jitters' when placed on the catapult and the carrier is moving

- ✓ Unfortunately it's a known glitch with carriers in FSX/P3D that *could* be aggravated with the ADV's external flight dynamics engine.

- ✓ If the aircraft is trapped in the catapult and the carrier is still accelerating, the application of a slight throttle (like in a low RPM engines check) will reduce the jittering.

21) At the end of the catapult launch I see vapor going out the wings. Is it a bug?

- ✓ No. You're carrying wing tanks which get pressurized as soon as the Weight Off Wheels condition is met. The WoffW transition is more abrupt in the cat launch than in a standard ground take-off. The sudden pressurization in this case usually causes some fuel venting.

22) I find difficult to control the aircraft in pitch just after the cat launch

✓ That's a realistic characteristic of the real jet that needs from some training to get used to.

- First, a correct T/O pitch trim setting (*) needs to be observed based on A/C configuration.
- Second, the catapult T/O correct technique must be followed (see NATOPS).

✓ Wing stores will reduce pitch stability and the usual aircraft CG at the launch instant will be at max AFT position. These two factors will cause an increased pitch sensitivity that needs from smooth and precise pitch stick inputs, more especially in the slatted aircraft (F-4S).

(*) note: As stated in the NATOPS, there's not a single take-off trim configuration allowing a "hands-off" catapult launch in all situations. For a same weight, there can be several CG / Stability Index (and thrust!) combinations that could modify the nominal numbers included in the chart. At the end, it's a matter of training to find the needed *slight* correction over the chart number resulting in an optimum catapult launch.

Personally, I've found useful to add 0.5 deg Nose-Down to the nominal T/O trim in aft CG configurations (CG @34-35% MAC)

23) I find difficult to control the aircraft in pitch

✓ Well, as mentioned above, just after the take-off the aircraft will probably be in an AFT CG configuration. This is especially true in "Clean" and/or external fuel tanks-only configurations (which further aggravates stability, btw). The AFT CG position and the Stability Index will impose maneuvering restrictions until some fuel is burned and a more forward CG position is attained.

- ✓ In those cases and in order to move the CG forward at a faster rate, the tanks selector can be placed in "*OFF*" position. This way the Tank #7 (located at the end of the fuselage) will be depleted first. Once Tank #7 emptied (check telelight warning light – "TANK F EMPTY") a nominal defueling can be resumed by placing FUEL TRANS switch in the corresponding position (*OUTBD, CTR* or *INT WING*).

24) Do I really need to care about the RAT (Ram Air Turbine)?

- ✓ Absolutely!

- ✓ If you are in the heat of a dogfight or just trying some high AoA maneuvering it's easy to exceed aircraft's AOA limits entering into a departure or even a spin. In those cases, the possibility of having a single or dual engine flame-out is high. Unlike the "E", the J and S versions are not provided with a battery and hence, an autonomous (DC) electrical power supply. This means, once both engines flamed out and both generators are off-line (RPM< 48÷53%), there is no electrical power…at all!. So, there's no possibility of engines re-light as igniters will be also "dead".

- ✓ RAT will supply electrical power (AC) to the ignition system and some other basic systems. With it you will be able to "bring back to life" your engines. So, be familiar with the RAT handle position (RAT command) and the emergency procedure to follow…just in case ;-)

  Note: The RAT operating speed limit is 520 kcas approx. If the speed limit is exceeded the RAT will be damaged, resulting inoperative.

25) I entered a spin with a dual engine flame-out…which is the procedure to follow?

- ✓ Eject Eject Eject!!

- ✓ In this case (spin + dual flame out), engines RPMs will decay quickly as well as the HYD power…and your only chance to exit the spin. Once the spin fully developed (flat) deploying the RAT probably will be useless for attempting an (already unlikely) engine re-start as the generator is immersed in the aircraft own wake and far from its design point (≈180kts *fwd* speed).

- ✓ Basically, the aircraft will be "dead" and unrecoverable. Well, you can still try the drag chute, but…

26) I find impossible to land the aircraft without crashing

- ✓ Well, that's why naval aviators are considered the best pilots! ☺

- ✓ You can uncheck "Realistic Landing Gear". This way the arrestor gear and landing gear structural limitations will be ignored.