

Landing Gear Layout

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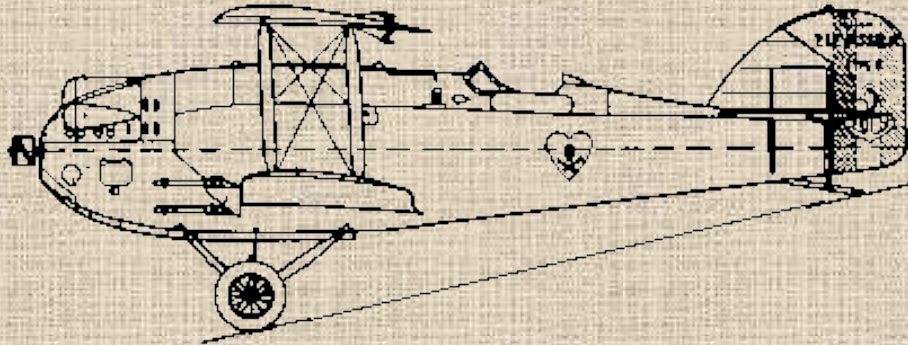
Introduction

- ❑ Most difficult subsystem to design & configure
- ❑ Requirements
 - Bear static loads while on ground
 - Allow smooth transition during take-off
 - Bear impact loads during landing
 - Provide comfortable ride to the passengers
- ❑ Desired features
 - Smallest possible size
 - Lowest possible weight
 - Least possible drag
 - Least complexity during operation and maintenance
 - Lowest operating cost

L G is a necessary evil !

- ❑ Used only for less than 0.5% of a/c life
- ❑ Many attempts made for disposable LG
 - Levasseur PL-8
 - Junkers Ju EF126 *Elli*
 - B-52 (in the initial design requirements)

Levasseur PL-8



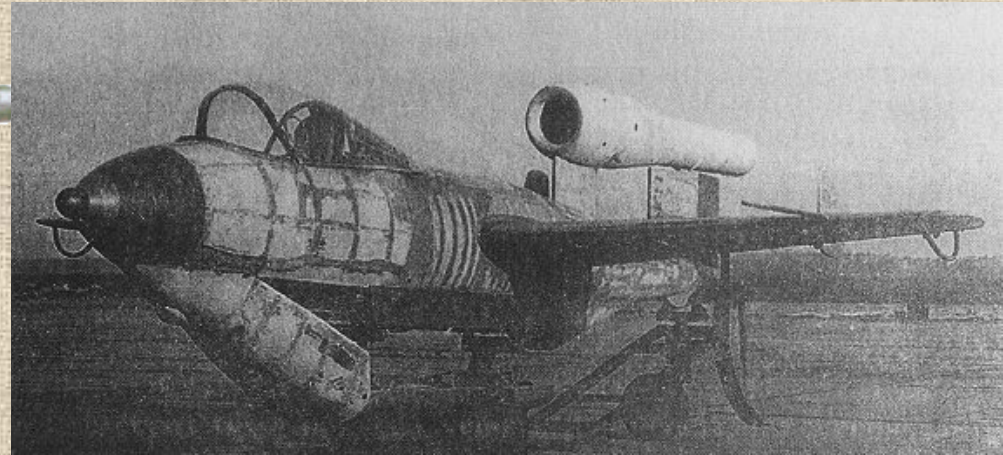
Levasseur PL.8



White Bird

- ❑ First to fly across the Atlantic Ocean nonstop (?)
 - Open-cockpit biplane
 - One 450 HP Piston Engine
 - Watertight fuselage that could float on water

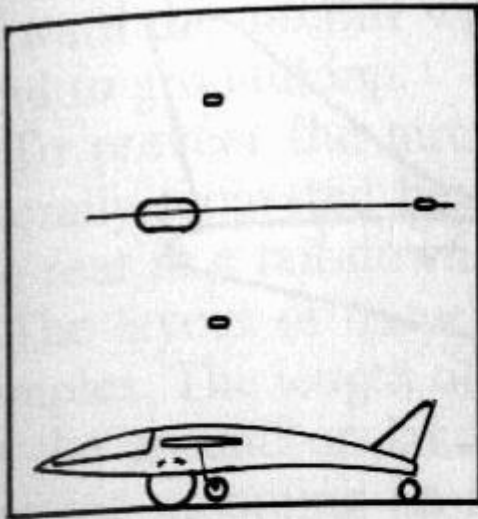
Junkers Ju EF126 *Elli*



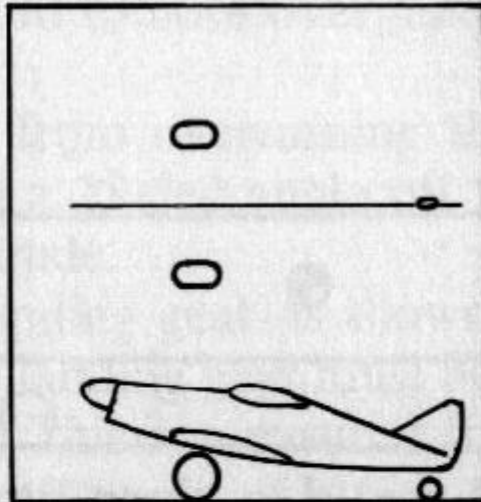
- ❑ Rapidly producible inexpensive small fighter a/c
- ❑ Pulsejet powered, with propeller driven startup
- ❑ RATO, using detachable solid fuel rocket motors
- ❑ Droppable Take-off dolly, retractable landing skid

Various Layouts for Landing Gear

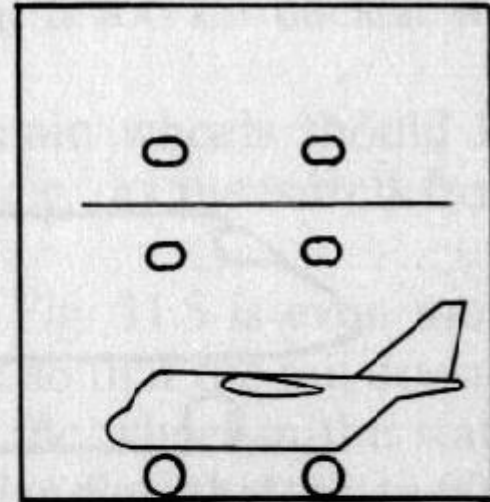
Landing Gear Arrangements



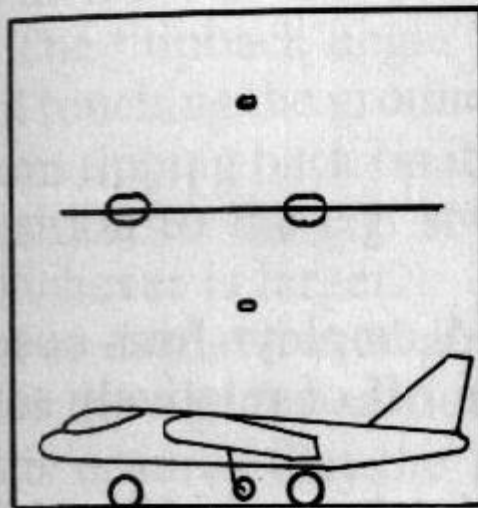
Single main



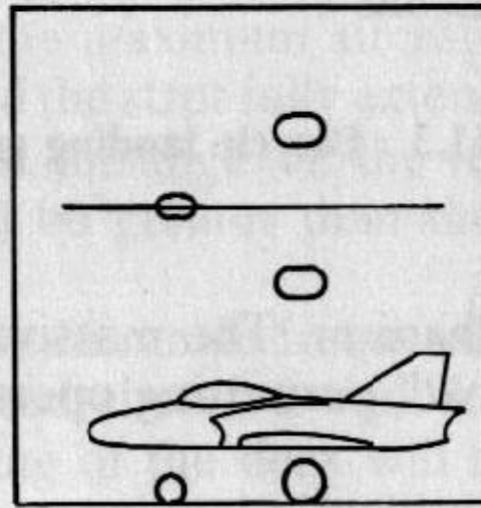
Taildragger



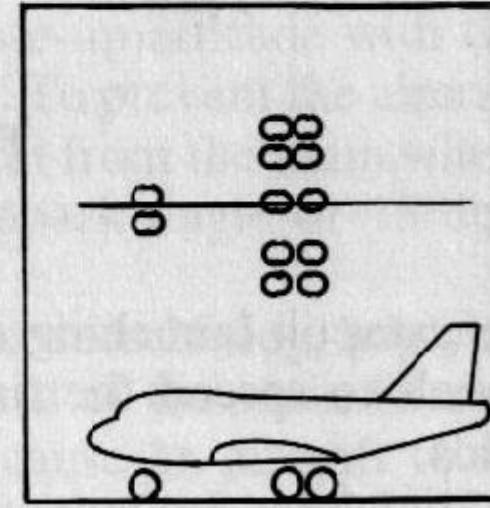
Quadricycle



Bicycle



Tricycle

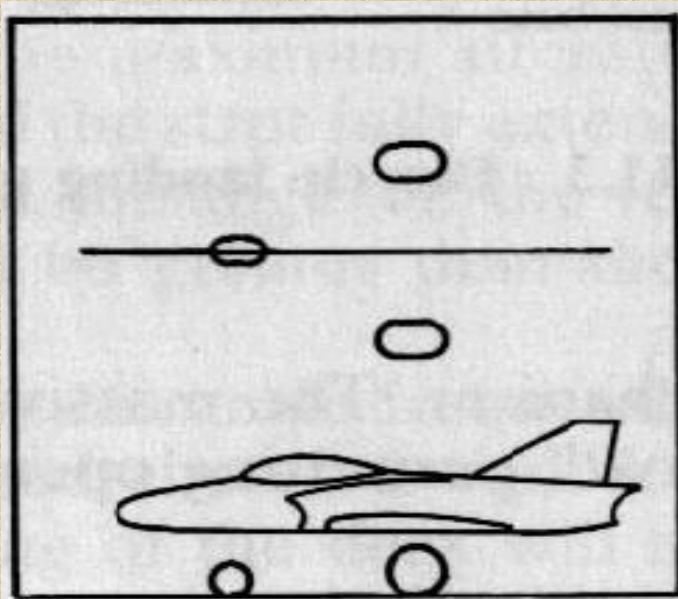


Multi-bogey

Tailwheel v/s Nosewheel Type

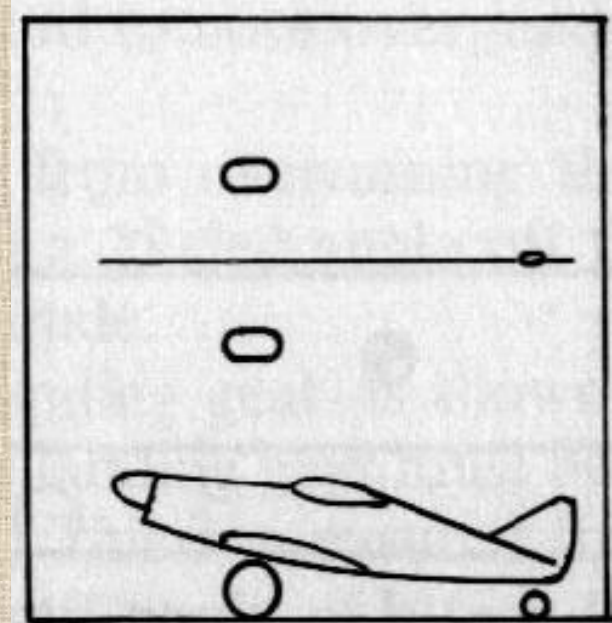
❑ Nosewheel Type

- Most common today
- Also called *Tricycle*
- MLG strut(s) behind CG
- Aux. wheel far ahead



❑ Tailwheel Type

- Most common earlier
- Also called *Tail dragger*
- MLG struts ahead of CG
- Aux. strut near rear end



Nosewheel and Tailwheel Type



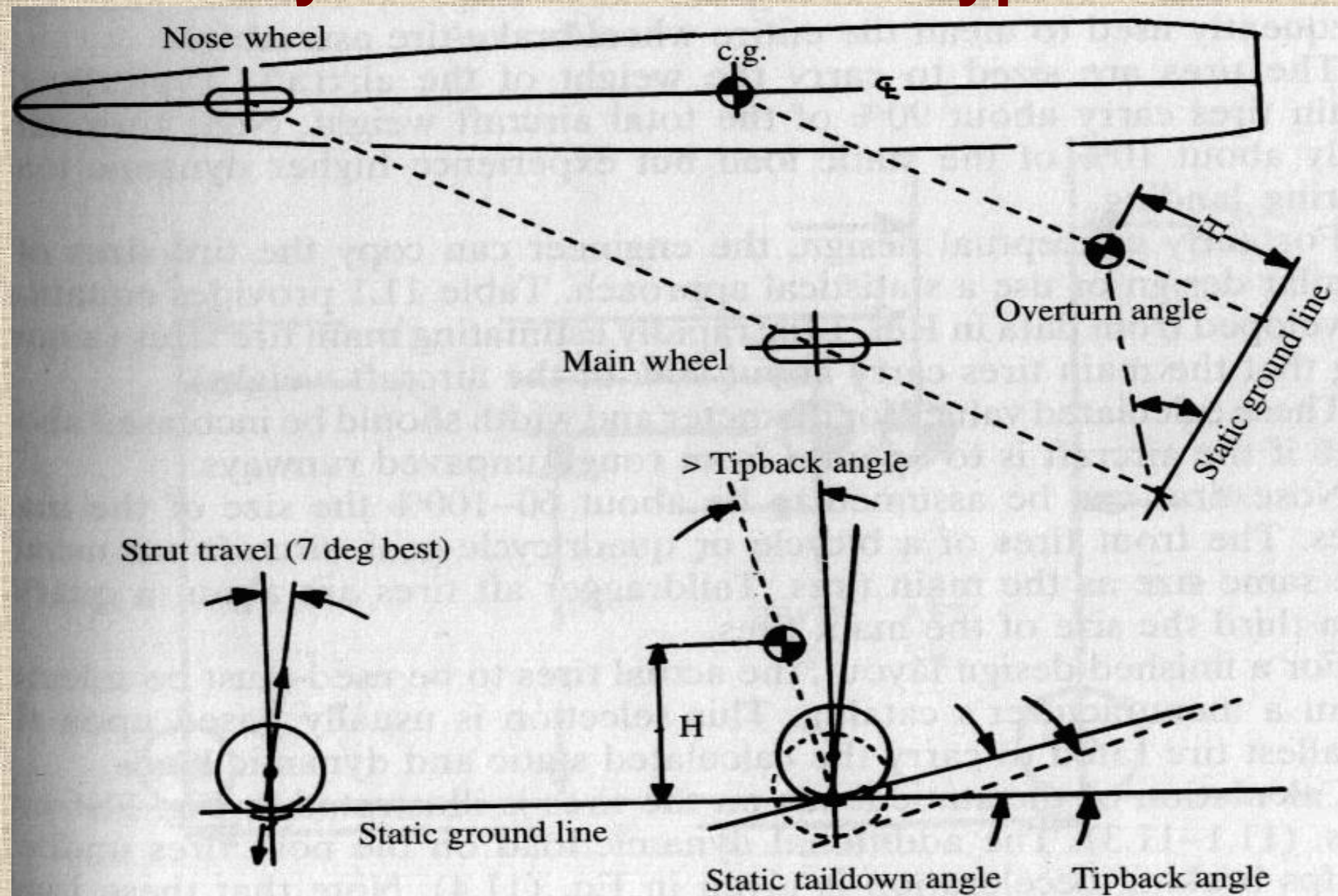
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Advantages of Nosewheel Type

- When on ground, the fuselage, cabin floor of the aircraft are roughly horizontal
- The view of the pilot when taxiing is relatively good.
- Nosewheel acts as a prop to prevent overturning during braking.
- Initial take off attitude has low drag
- The nose down pitch resulting from a two point landing helps to shed lift

Layout of Nosewheel Type

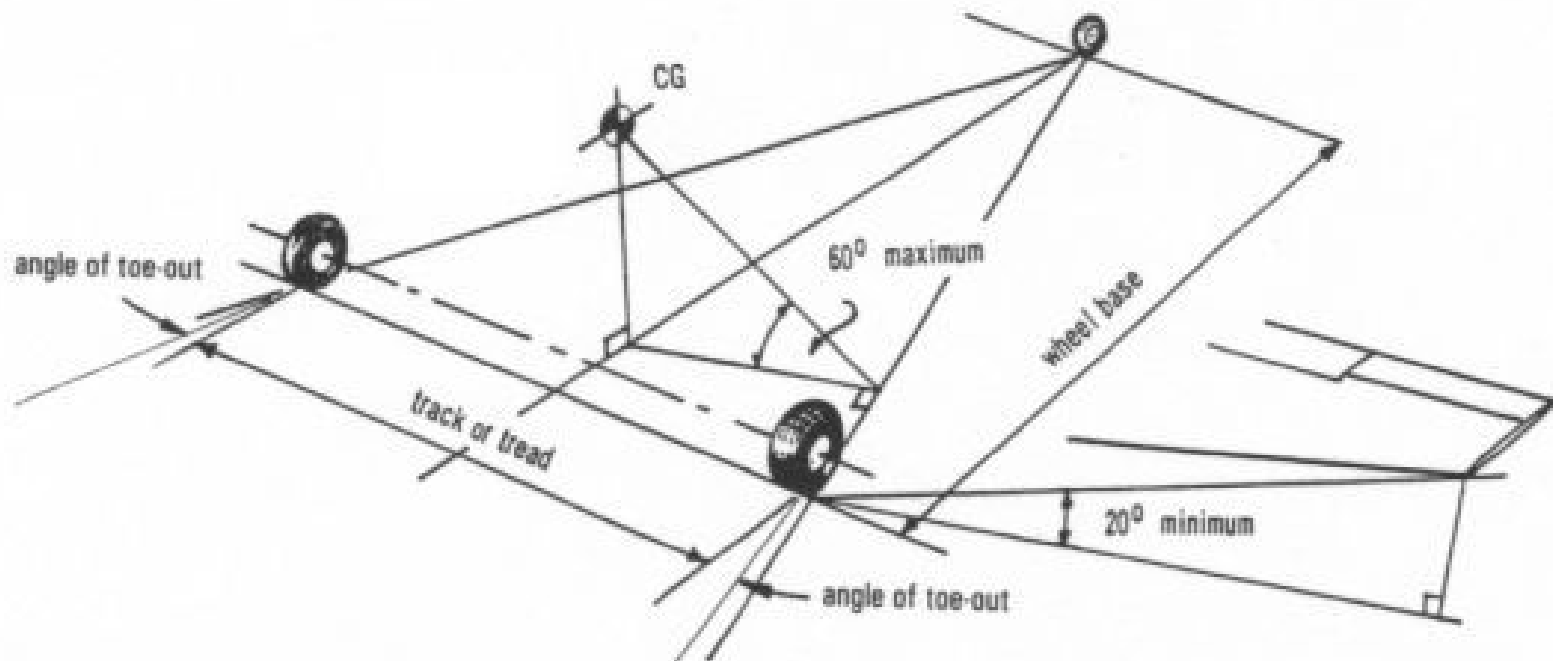
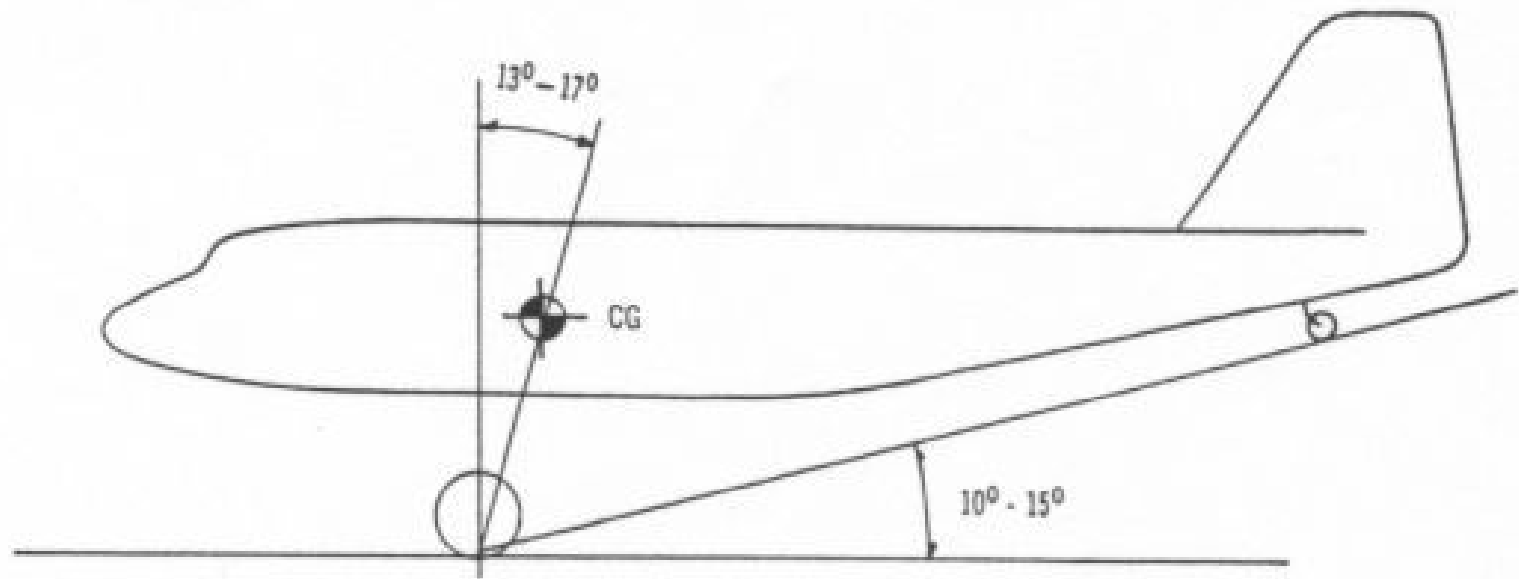


Advantages of Tailwheel Type

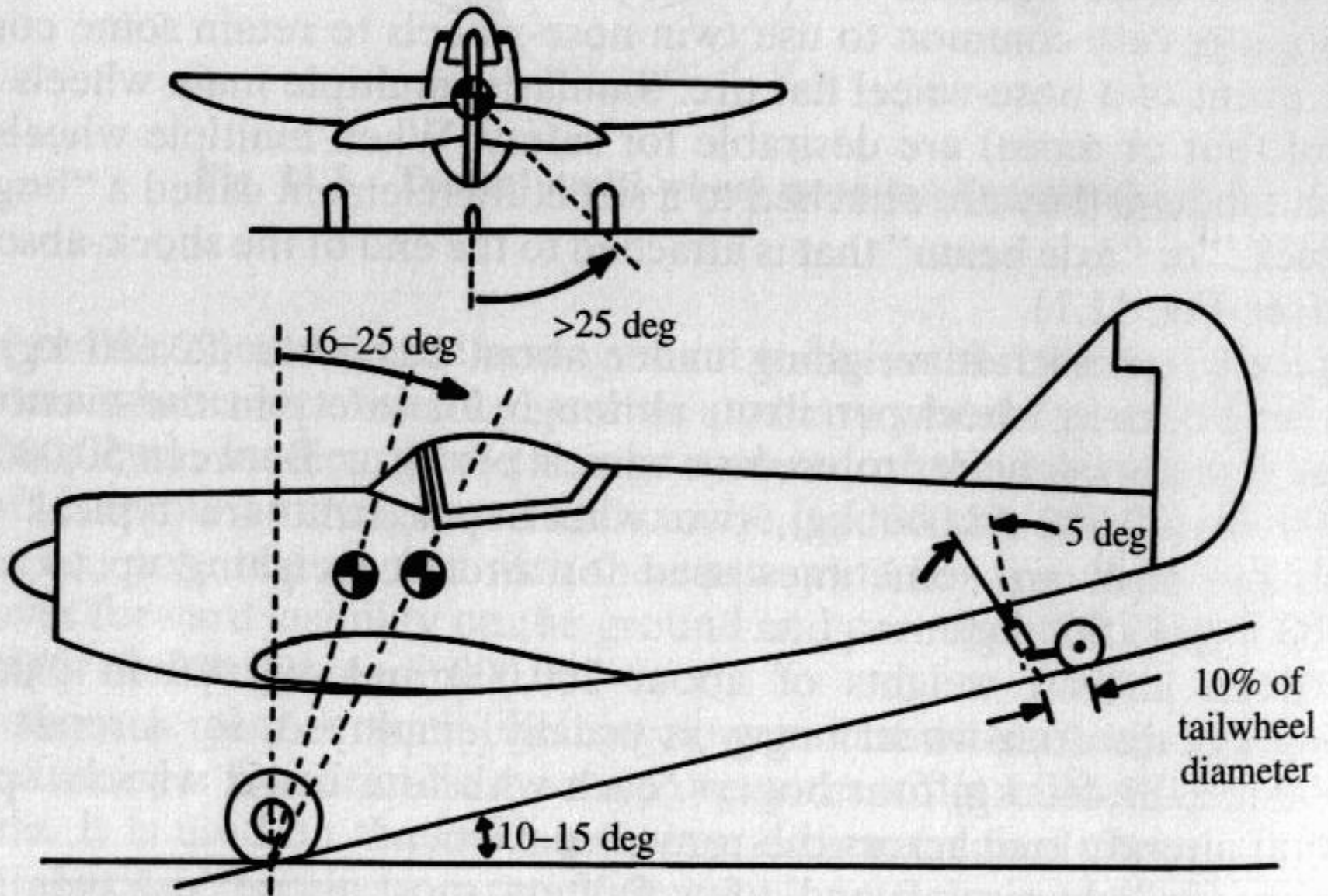
- ❑ Simplicity
- ❑ Small and light Tailwheel
- ❑ Ease in streamlining MLG
- ❑ Large AOA during ground roll
- ❑ Large ground clearance for nose propeller
- ❑ Ease in ground handling
- ❑ During braking, aircraft tends to pitch nose down
 - increasing MLG reaction increased
 - possibility of skidding reduced
- ❑ Easier to mount MLG onto suitable structure

Demerits of Tailwheel Type

- ❑ Instability in landing since CG is behind MLG
 - If single leg hits ground, then a/c tends to swing in that direction
 - Pilot has to ensure symmetric landing
- ❑ Inclined fuselage floor while on ground
 - Poor pilot visibility during taxiing
 - Difficulty in Cargo and passenger handling / serving
 - Increased pressure on fuel pump due to inclination

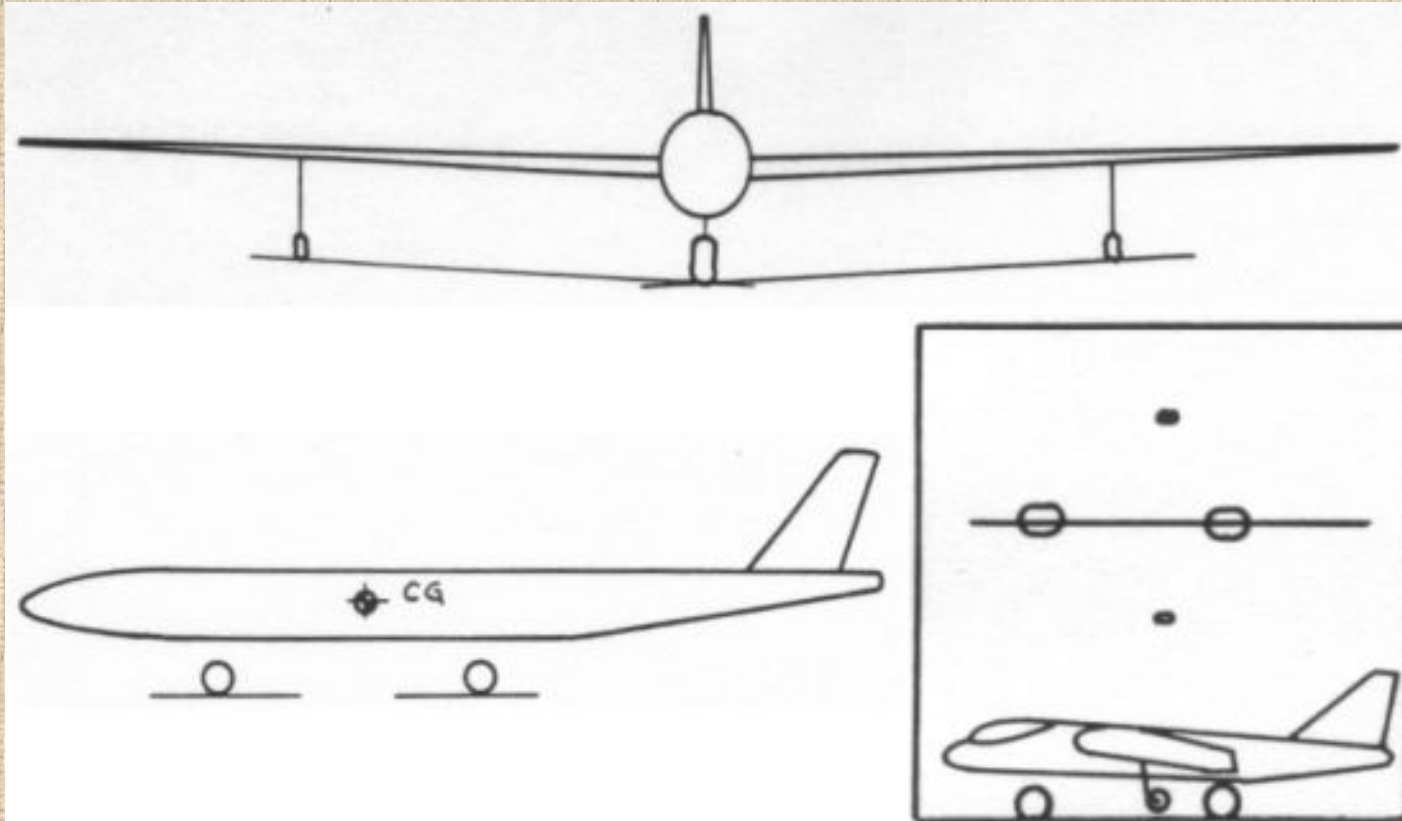


Layout of Tailwheel type



Bicycle Type

- ❑ Two MLG and small outrigger wheels
- ❑ Used when
 - Central fuselage is already occupied
 - Large CG movement is expected



Merits and Demerits of Bicycle layout

□ Advantages:

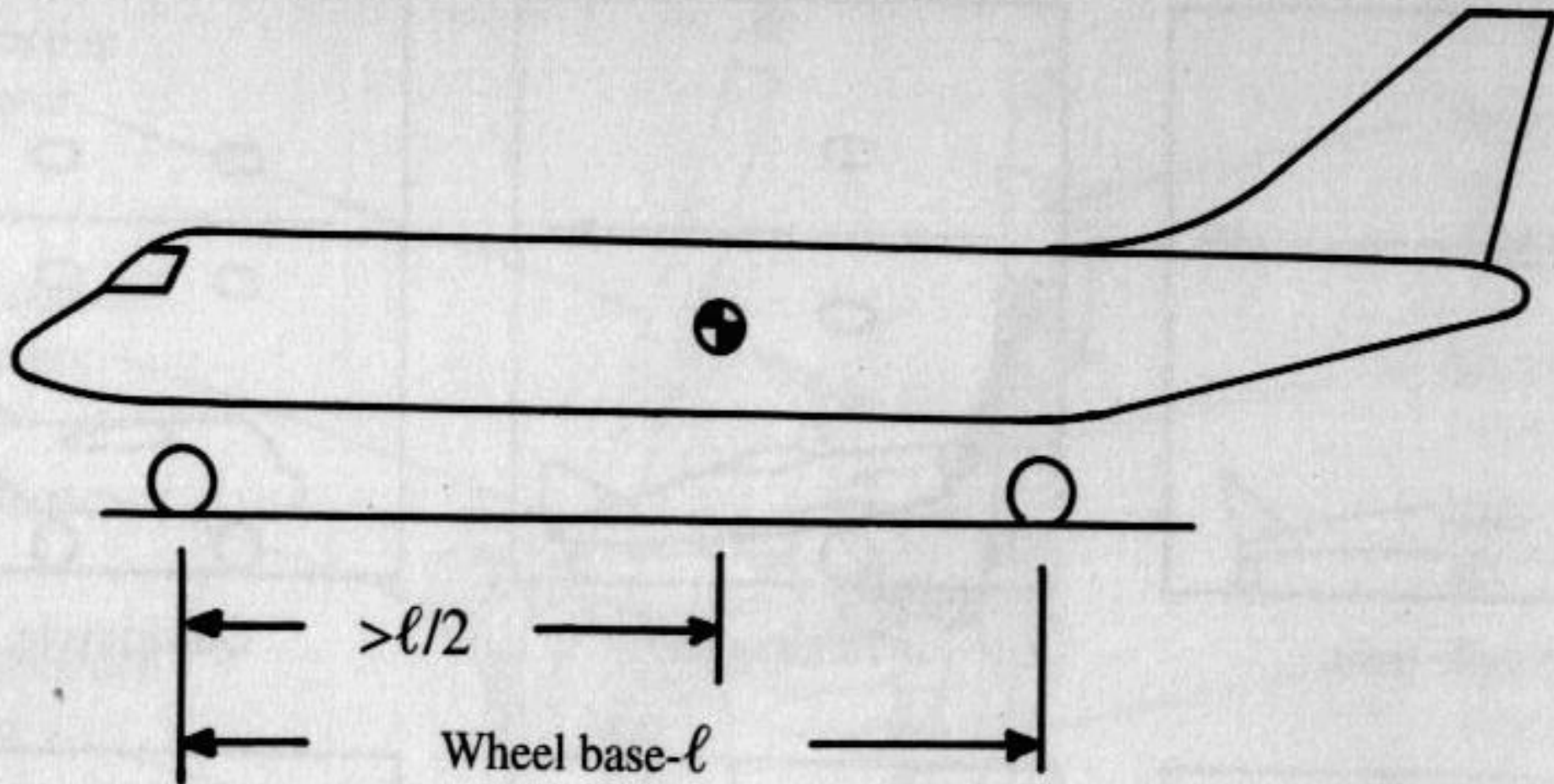
- MLG located roughly aft of the CG.
- Wheels are located on the centerline of the aircraft

□ Disadvantages:

- Outriggers necessary
- The aircraft landing attitude must be carefully controlled
- Considerable elevator power for nosewheel liftoff

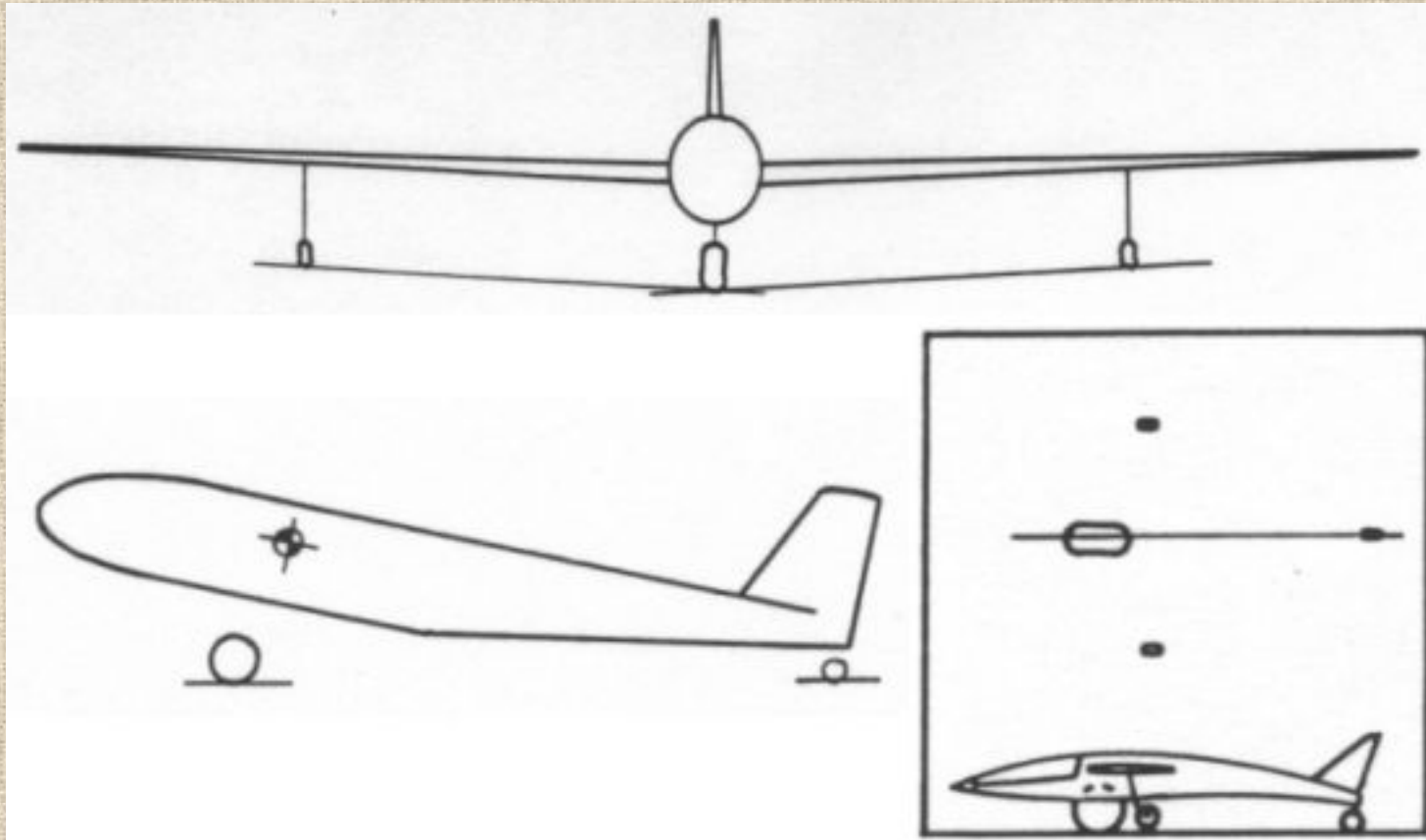


Bicycle landing gear geometry



Single Wheel Type

- ❑ Subcategory of the Bicycle Type
- ❑ Single MLG with small Aux. wheel
- ❑ Outriggers needed for stability



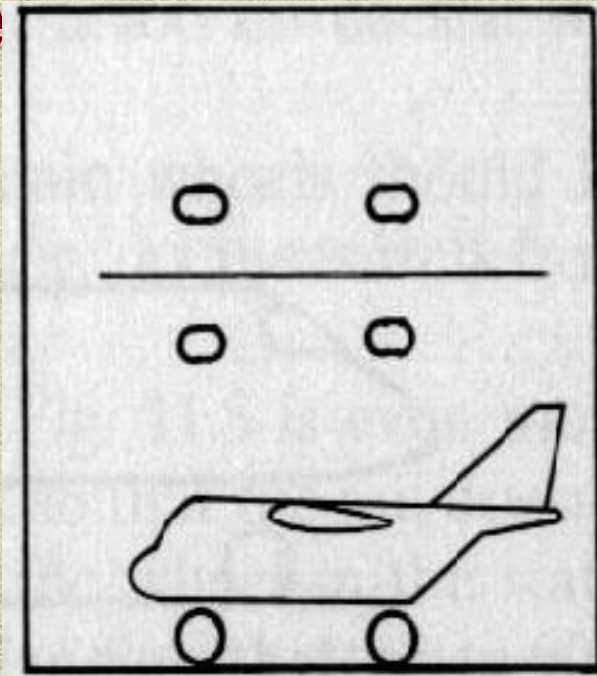
Advantages of Single Wheel Type

- ❑ Simple, lightweight, and low drag
- ❑ May include skids rather than wheels
- ❑ Used on light planes like gliders and sailplanes
- ❑ Generally impractical for larger aircraft
- ❑ Example: U-2 Reconnaissance aircraft

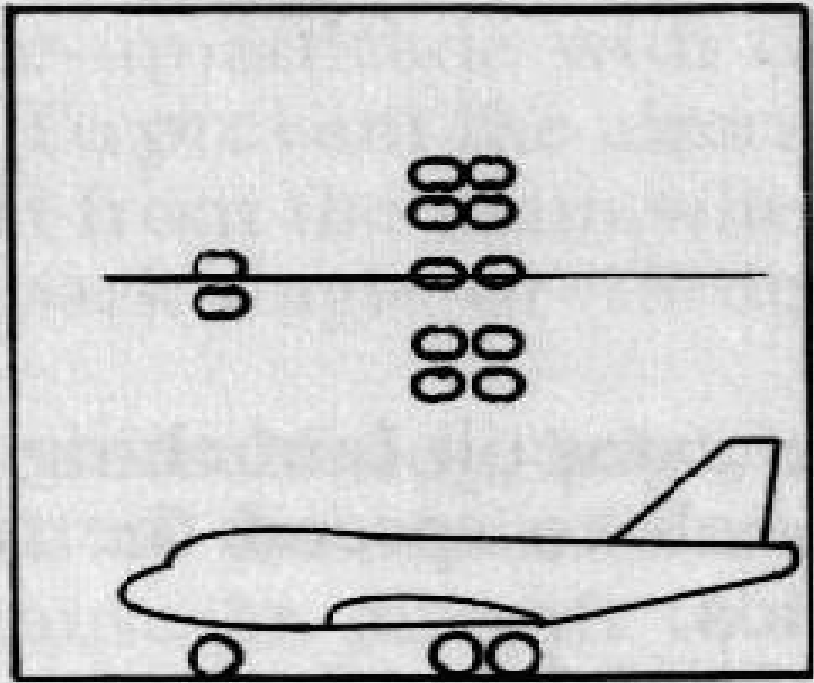


Quadricycle Type

- ❑ Subset of Bicycle type
- ❑ MLG at the side of fuselage
- ❑ Advantages
 - Low cargo floor for easy loading / unloading
 - Lateral stability without outrigger wheels



Multibogey Type



□ No. of wheels per strut

- $W_{TO} \leq 50,000 \text{ lb}$
- $50,000 \leq W_{TO} \leq 200,000 \text{ lb}$
- $200,000 \leq W_{TO} \leq 400,000 \text{ lb}$
- $W_{TO} \geq 400,000 \text{ lb}$

One

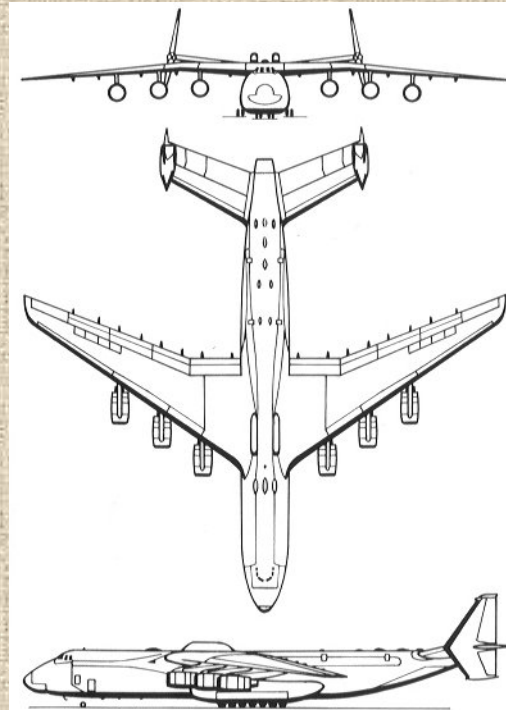
Two

Four

Six

LG of AN-225 *Mriya*

- ❑ Seven pairs of wheels on MLG, two pairs on nosewheels
- ❑ Possible to adjust pressure of each tire on MLG



L G layout for higher floatation

□ Track Type Layout

- Reduces loading on runway
- Operation from soft ground / unprepared strips

