

Sub-Module 05
FASTENERS

Aircraft Hardware

- Aircraft hardware is the term used to describe the various types of fasteners and miscellaneous small items used in the manufacture and repair of aircraft.
- The safe and efficient operation of any aircraft is greatly dependent upon the correct selection and use of aircraft hardware.
- An aircraft, even though made of the best materials and strongest parts, would be of doubtful value unless those parts were firmly held together.
- Several methods are used to hold metal parts together; they include riveting, bolting, brazing, and

Identification

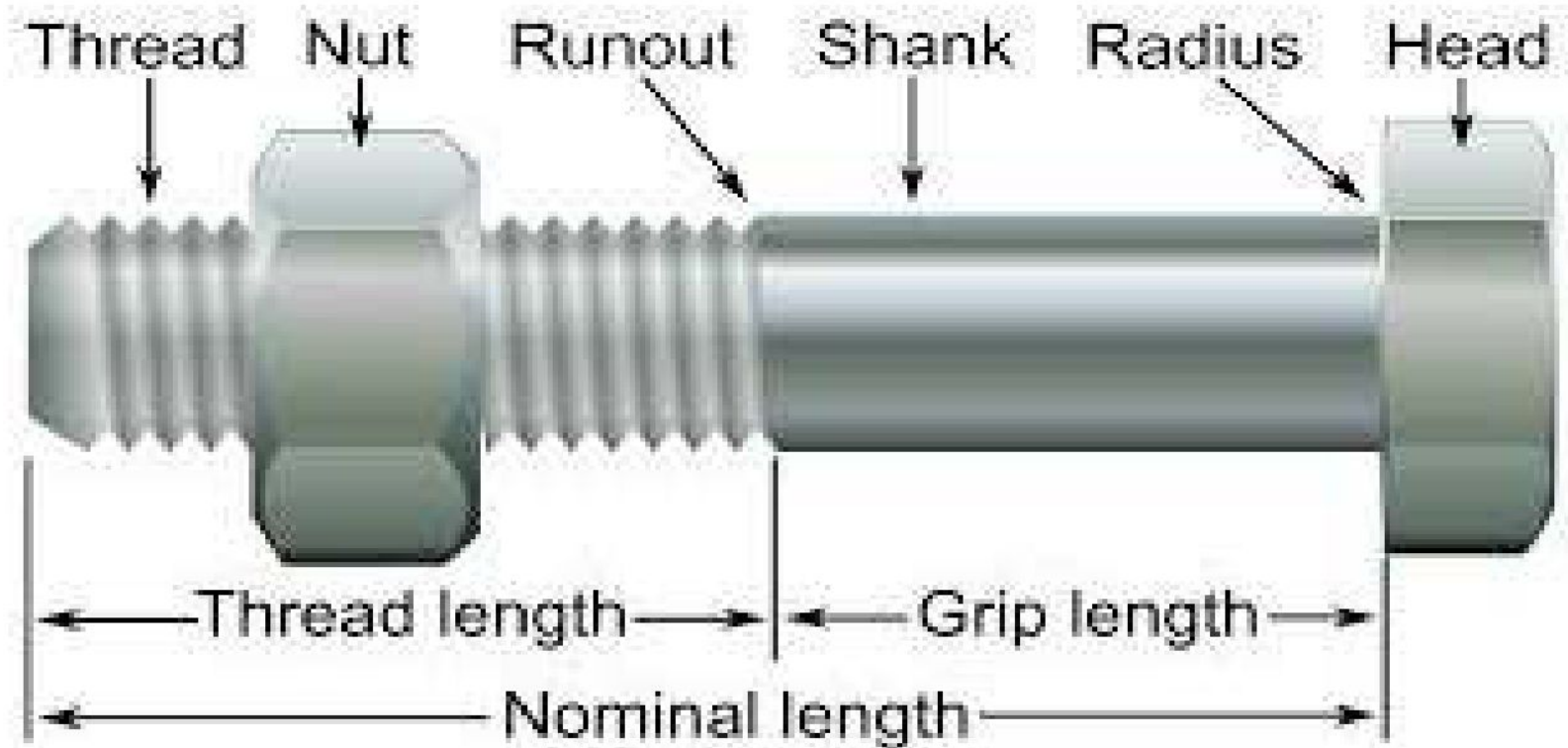
Most items of aircraft hardware are identified by their specification number or trade name. Threaded fasteners and rivets are usually identified by:

- AN (Air Force-Navy),
- NAS (National Aircraft Standard), or
- MS (Military Standard) numbers.

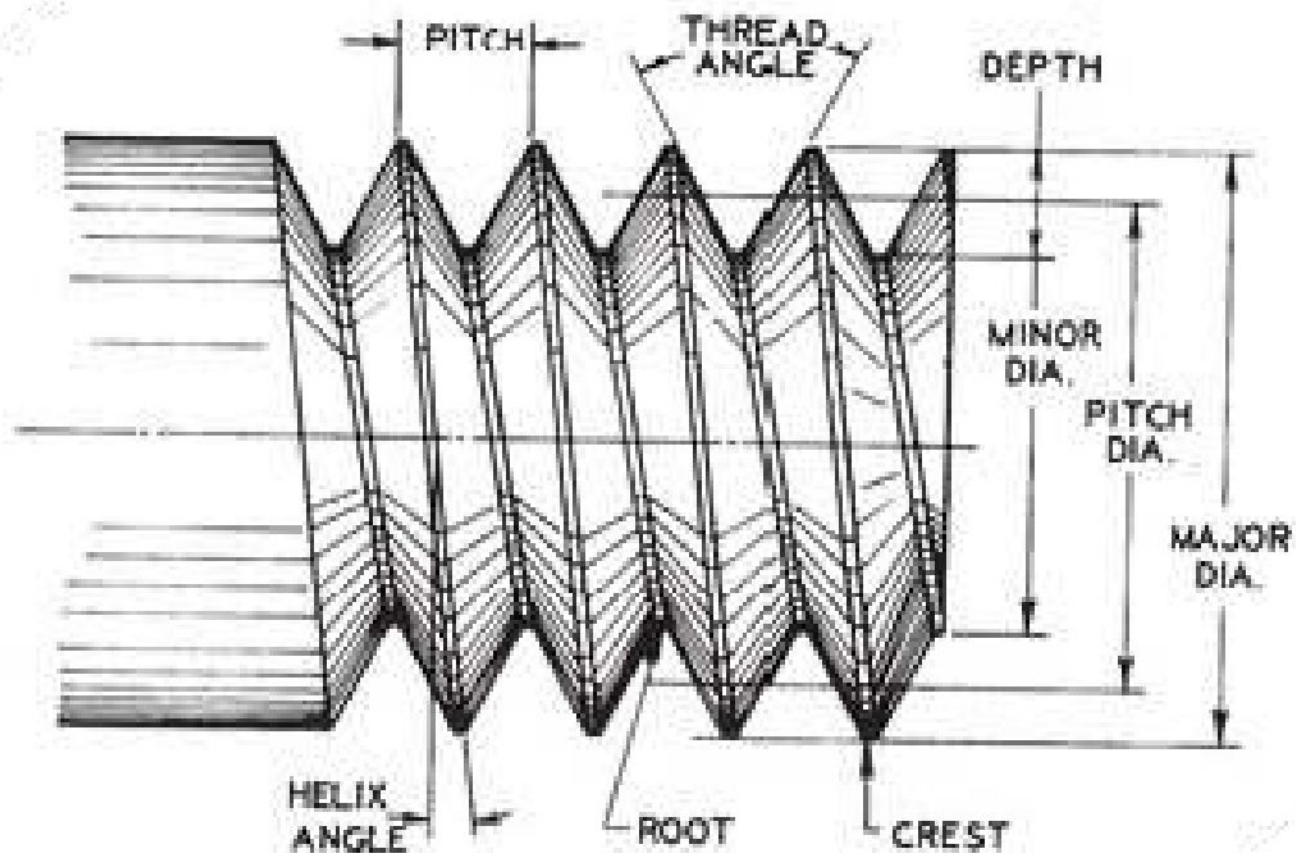
Threaded Fasteners

- Various types of fastening devices allow quick dismantling or replacement of aircraft parts that must be taken apart and put back together at frequent intervals.
- Riveting or welding these parts each time they are serviced would soon weaken or ruin the joint.

Bolt and Screw Terminology.



Threaded fastener nomenclature



Screw Thread Uses



Adjusters



Fasteners



Mechanical Advantage

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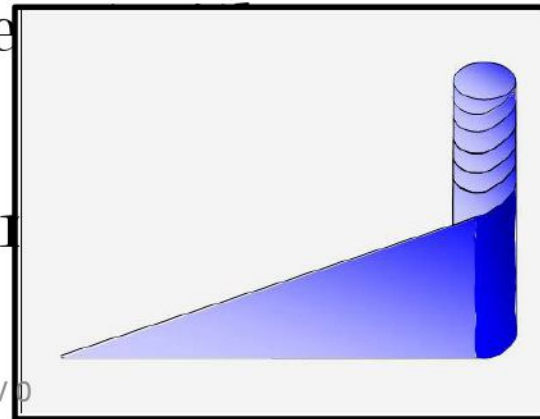
Transfer Power

SCREW THREAD USE

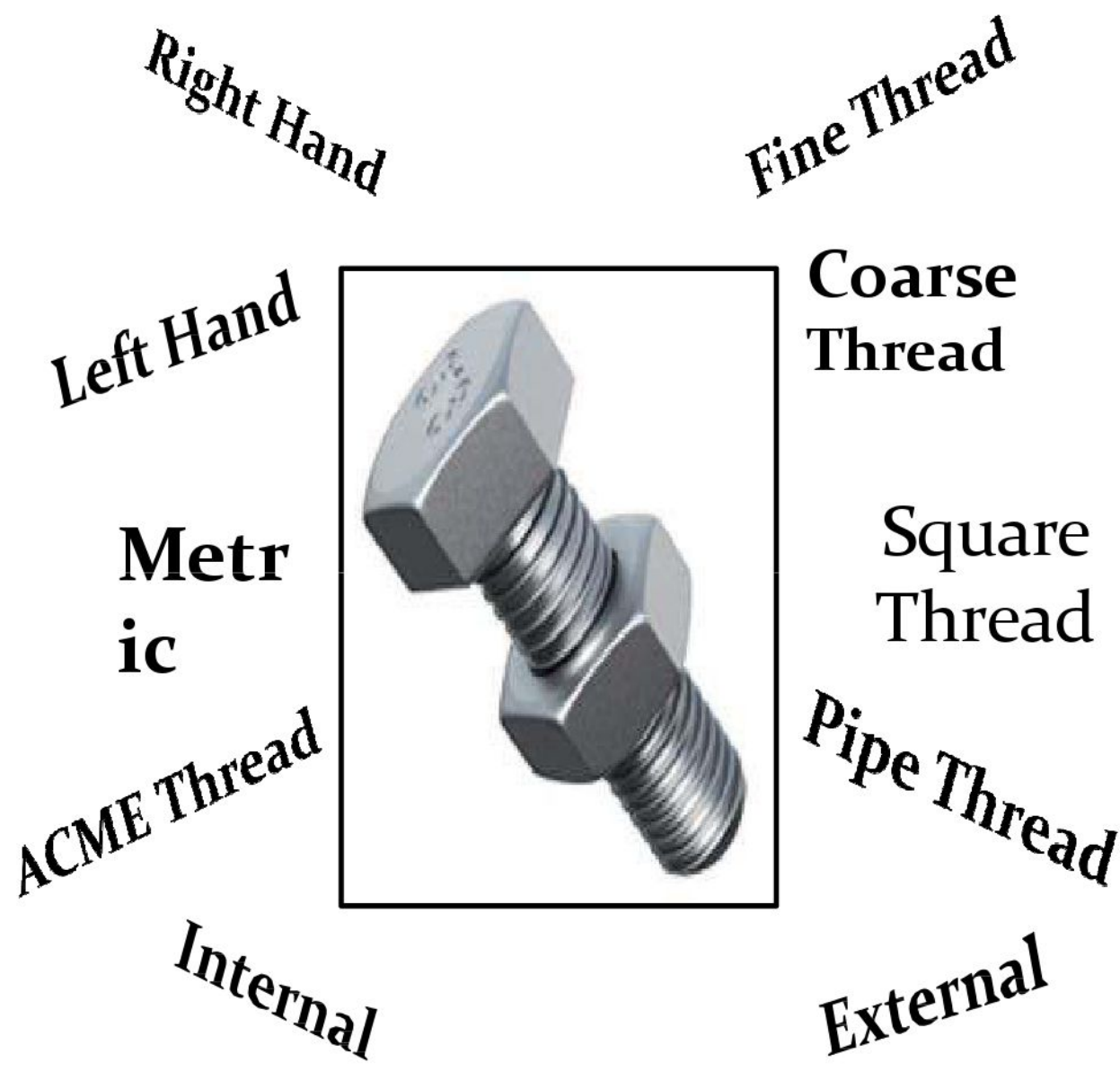
- **Fastener** – (bolts, nuts, and screws)
used to hold parts together
- **Movement** – (lathe lead screw)
transmits twisting power to straight line motion
- **Mechanical advantage** – (vise and clamp screws) increases force to hold items
- **Adjustments** – allows parts to be moved

DEFINITION OF THREAD

- A screw thread is a wedge wrapped around a cylinder.
- A thread is a uniform helical groove cut inside of a cylindrical work piece, or on the outside of a tube or shaft.
- Screw threads are cut with the die & tap.
- For accuracy Screw threads are cut on the lathe.
- Both inch and metric screw threads can be cut using the lathe.



International Standard	Common Abbreviation
American National Coarse	ANC
American National Fine	ANF
Unified National Fine	UNF
Unified National Coarse	UNC
British Association	BA
British Standard Fine	BSF
ISO Metric	M

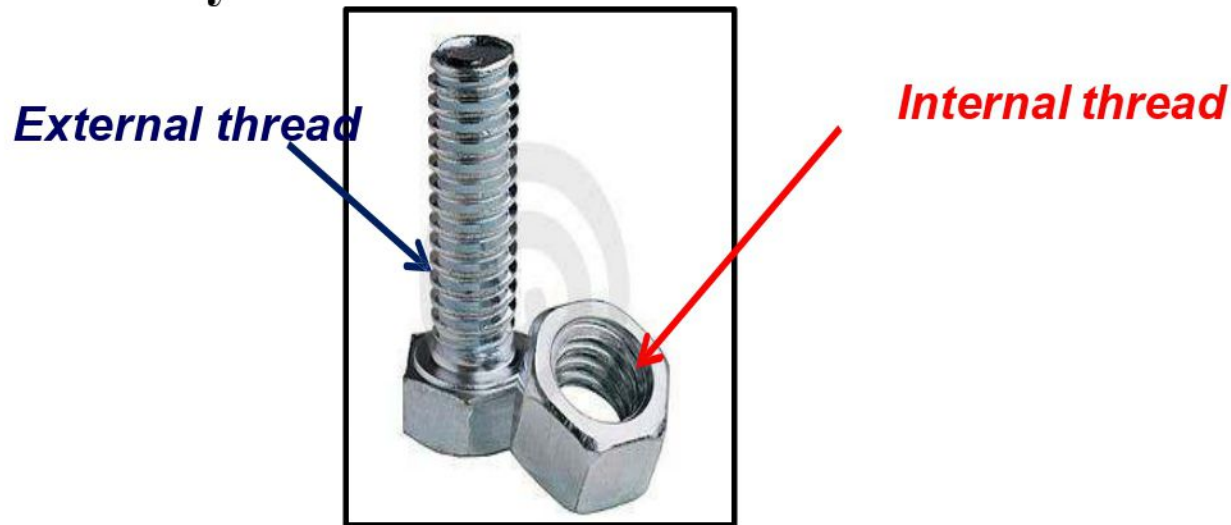


SCREW THREAD

TERMINOLOGY

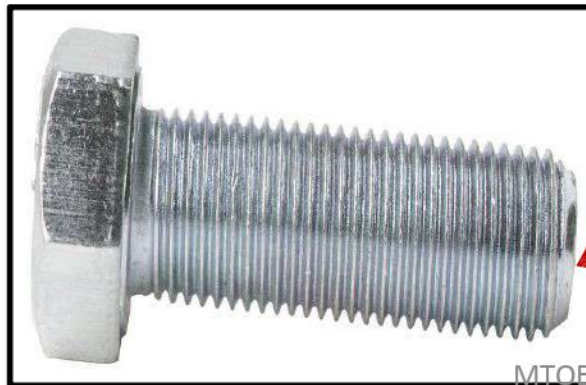
External (Male) thread – A thread cut on the outside of a cylindrical body.

Internal (Female) Thread - A thread cut on the inside of a cylindrical body.





- **Right-handed-** threads tighten by turning clockwise.
- **Left-handed-** threads tighten by turning counter-clockwise.
- **Chamfer-** A chamfer on the end of the screw thread makes it easier to engage the nut.



Chamfer

FINE AND COURSE THREAD

Fine Thread

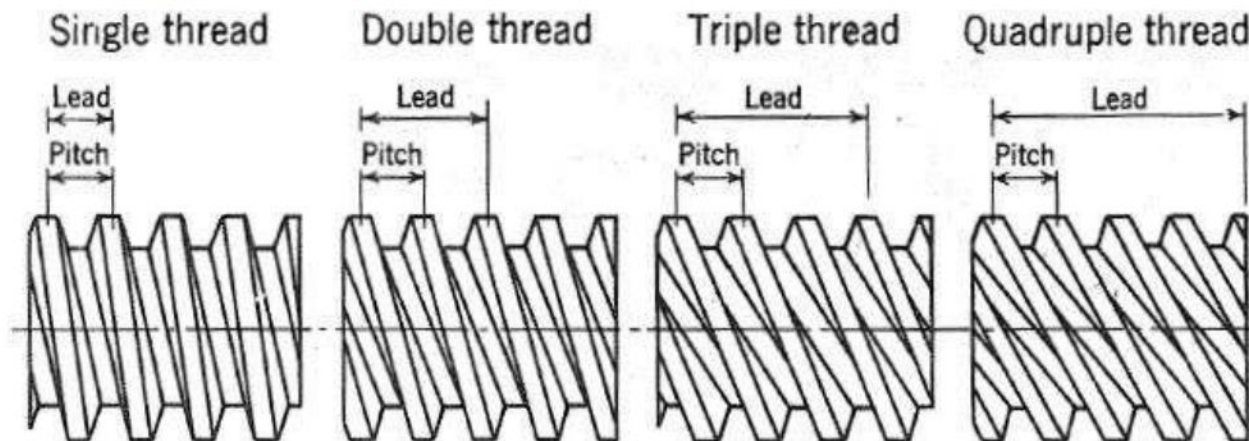
- Since they have larger stress areas the bolts are stronger in tension
- Their larger minor diameters develop higher torsional and transverse shear strengths
- They can tap better in thin-walled members
- With their smaller helix angle, they permit closer adjustment accuracy



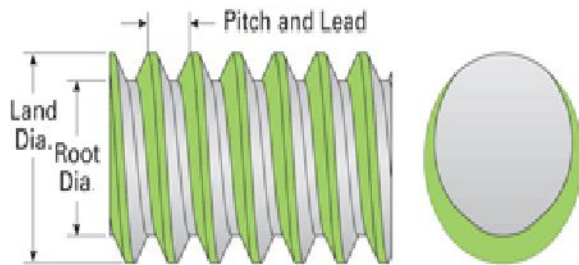
Coarse Thread

- Stripping strengths are greater for the same length of engagement
- Improved fatigue resistance
- Less likely to cross thread
- Quicker assembly and disassembly
- Tap better in brittle materials
- Larger thread allowances allow for thicker platings and coatings

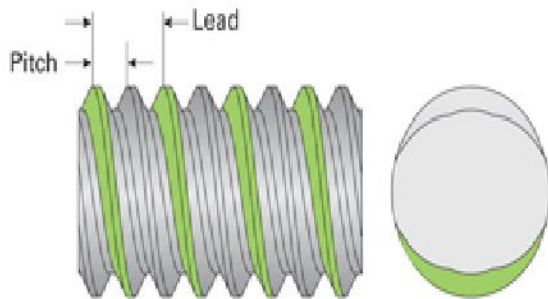
- **Single Thread:** A single thread is a thread that has a lead equal to the pitch.
- **Multiple Threads:** Multiple threads are threads in which the lead is an integral multiple of the pitch.
- A multiple thread having two starts, or separate threads, is called a double thread; one having three starts is called a triple thread; one with four starts is called a quadruple thread.



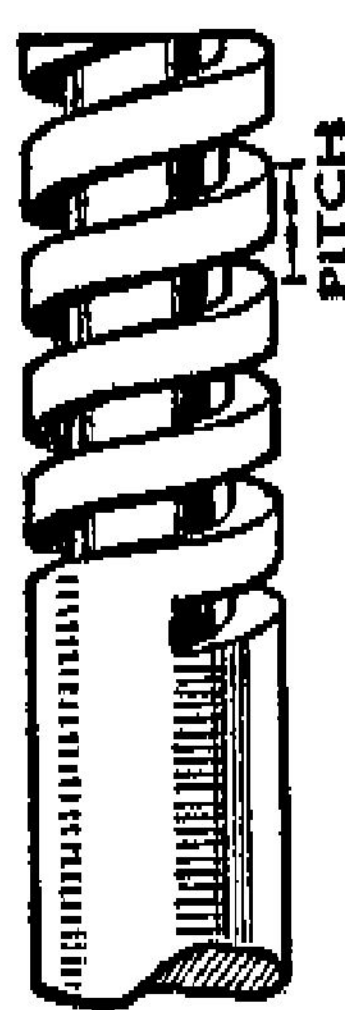
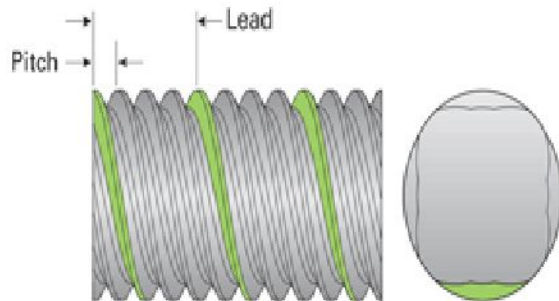
Single Start (Lead = Pitch)



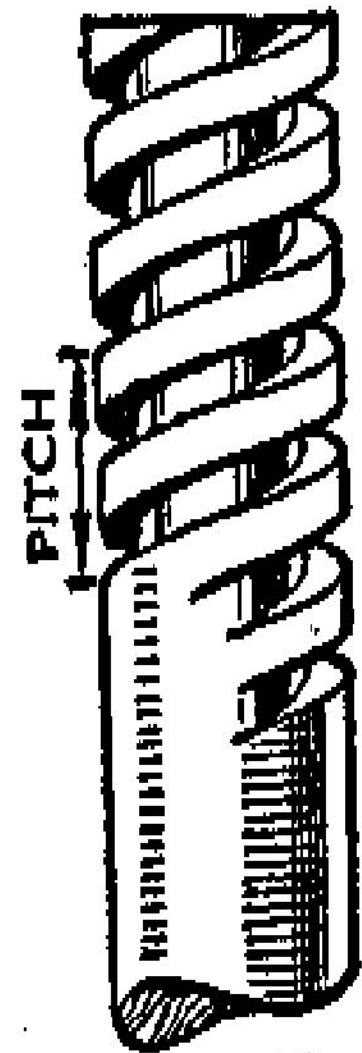
Double Start (Lead = 2 x Pitch)



Four Start (Lead = 4 x Pitch)



**SINGLE
RIGHT HAND
THREAD**



**DOUBLE
RIGHT HAND
THREAD**

- **Thread fit is the way a bolt and nut fit together as to being too loose or too tight.**
- **Metric threads are threads that are measured in metric measurement instead of inch measurement.**
- **Major diameter (formerly known as outside diameter): The largest diameter of the screw or nut.**
- **The term major diameter replaced the term outside diameter, as applied to the thread of a screw, and also the term full diameter, as. Applied to the thread of a nut.**
- **Minor diameter (formerly known as core diameter or root diameter): The smallest diameter of the thread of the screw or nut.**
- **The term minor diameter replaced the term core diameter, as applied to the thread of a screw, and also the term inside diameter, as applied to the thread of a nut.**

- **Pitch:** The distance from a point on a screw thread to a corresponding point on the next thread, measured parallel to the axis.
- **Lead:** The distance a screw thread advances axially in one turn. On a single-thread screw, the lead and pitch are identical; on a double thread screw, the lead is twice the pitch; on a triple-thread screw, the lead is three times the pitch; and so forth.
- **Crest (also called "flat"):** The top surface joining the two sides of a thread.
- **Root:** The bottom surface joining the sides of two adjacent threads.

- **Pitch diameter:** On a straight screw thread, it is the diameter of an imaginary cylinder, the surface of which would pass through the threads at such points as to make equal the width of the threads and the width of the spaces cut by the surface of the cylinder.
- On a tapered screw, it is the diameter of an imaginary cone at a given distance from a reference plane perpendicular to the axis.
- The surface of the imaginary cone would pass through the threads at such points as to make equal the width of the threads and the width of the spaces cut by the surface of the cone.



- **Angle of thread:** The angle included between the sides of the thread, measured in an axial plane.
- **Helix angle:** The angle made by the helix of the thread at the pitch diameter, with a plane perpendicular to the axis.
- **Side or Flank:** The surface between crest and root.
- **Axis of a screw:** The longitudinal\center line through the screw.
- **Base of thread:** The bottom section of the thread; the greatest section between the two adjacent roots.
- **Depth of thread:** The distance between the crest-and the base of the thread, measured perpendicular to the axis.

