ASSEMBLING MANUAL

ARTES JET

Microturbines

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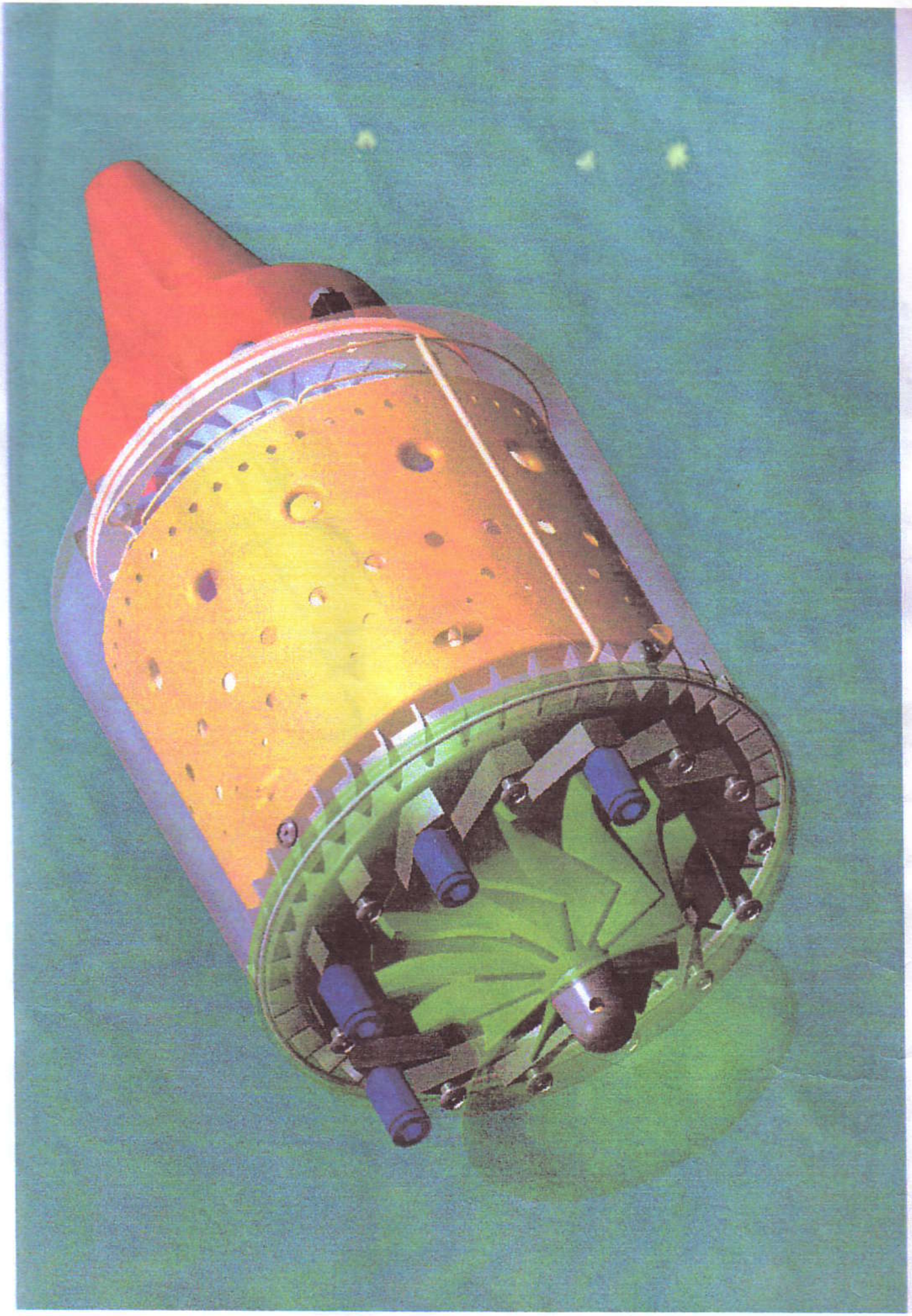
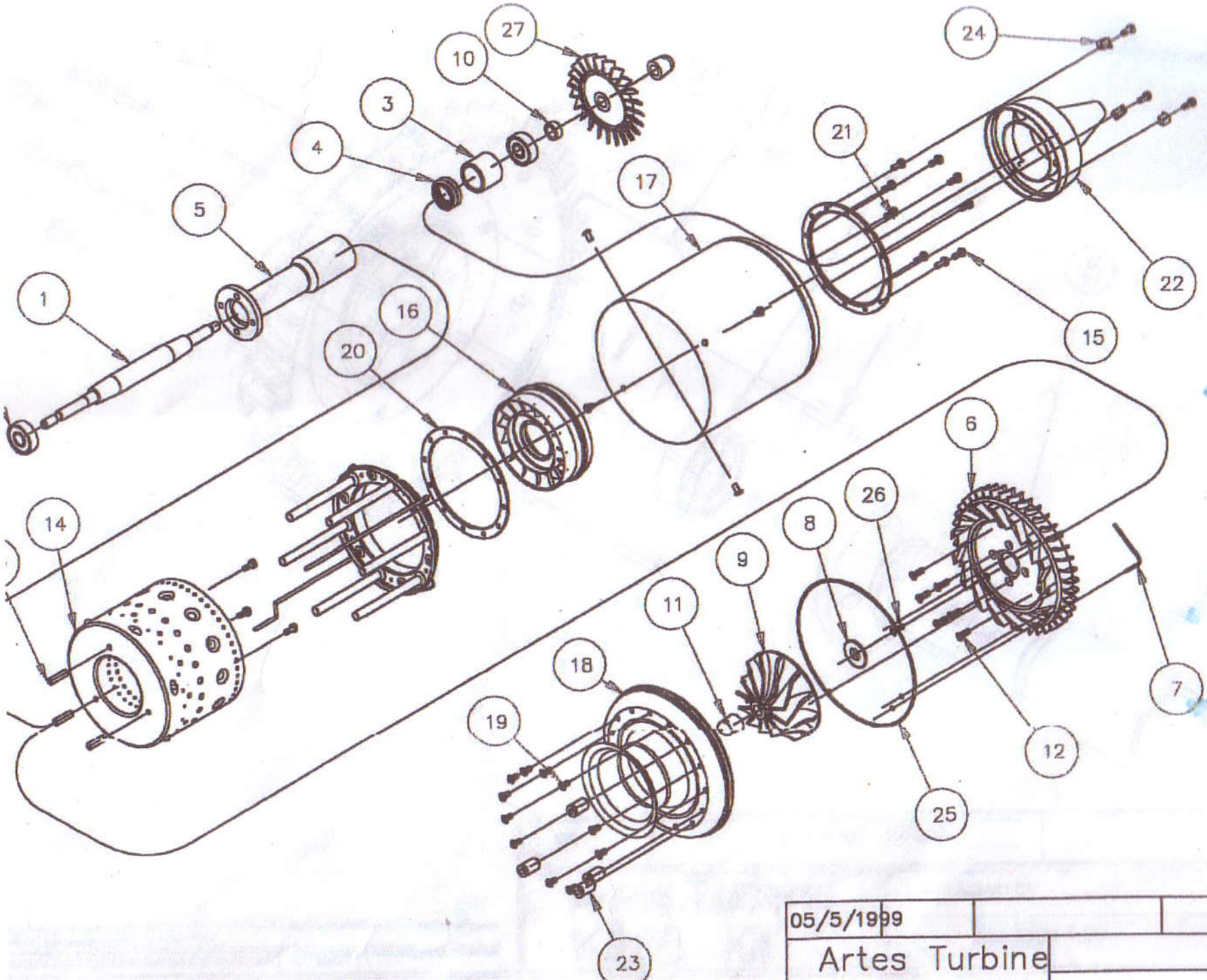
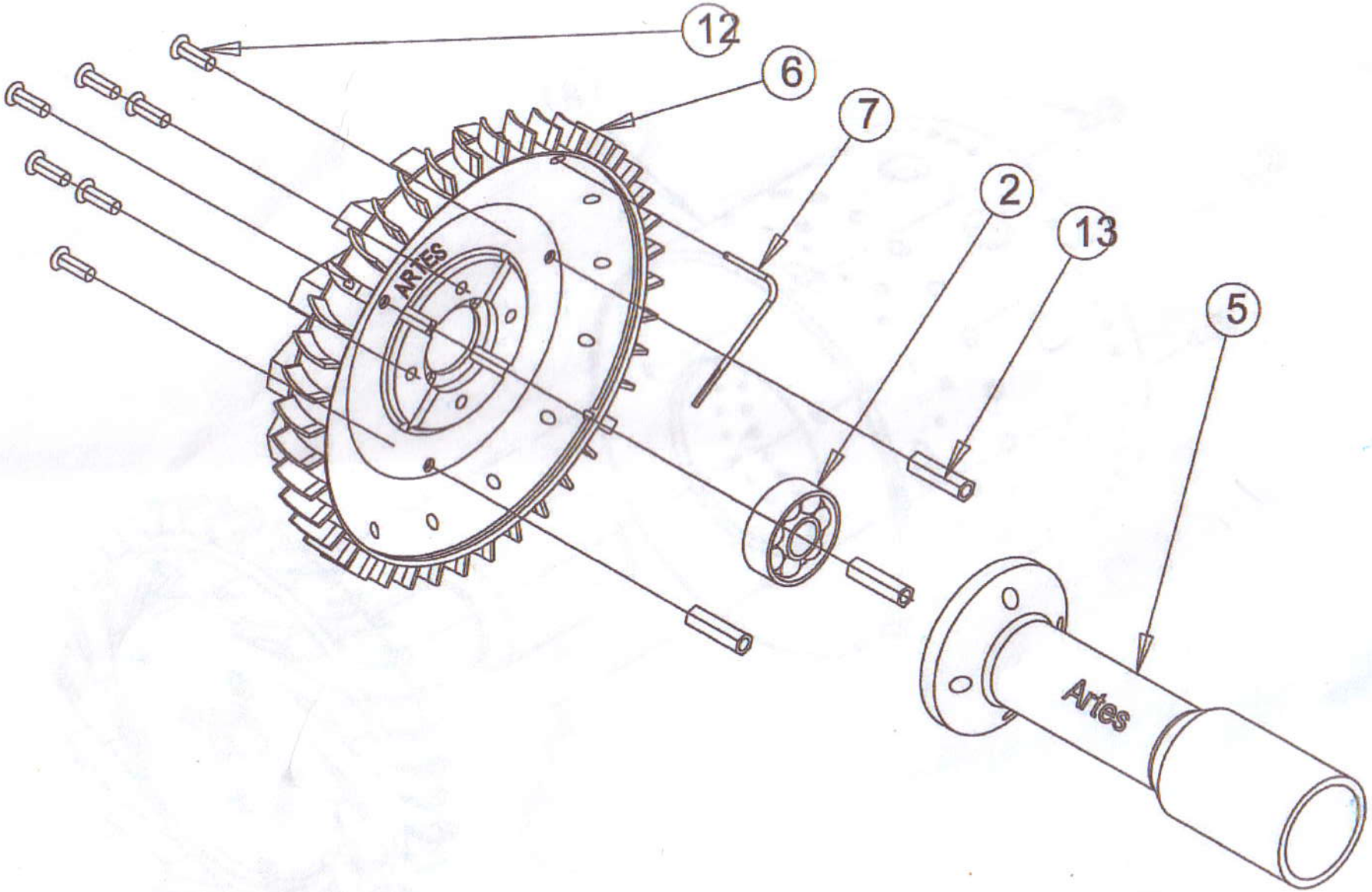




Pos	Name
1	Shaft
2	Bearing
3	Preload spacer
4	Spring
5	Shaft tunnel
6	Front diffusor
7	Lubrification pl
8	Front spacer
9	Compressor
10	Rear spacer
11	Compressor nu
12	VTSEI M3x12
13	Chamber spac
14	Combustion ch
15	VTCEI M3x 12
16	Rear difusor (I
17	Envelope
18	Front cover
19	VTBEI M3x8
20	Internal ring
21	External ring
22	Exaustin cone
23	Festo racord
24	Cone clamp
25	Front ORing
26	Pipe ORing
27	Turbine disck

05/5/1999				
Artes Turbine				



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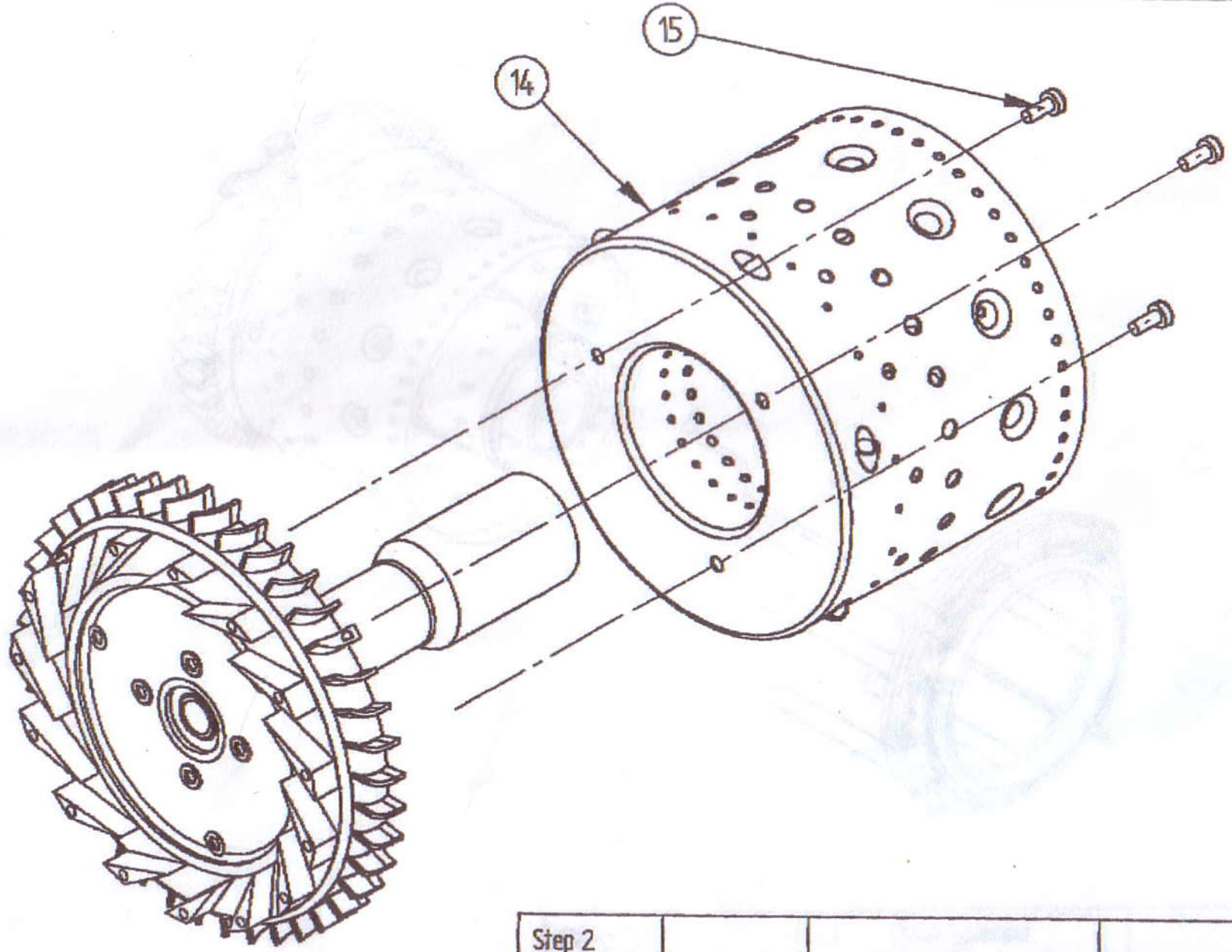
Artes Turbine KJ 66 - Kit				Drawn by			
				Revision 1.00			



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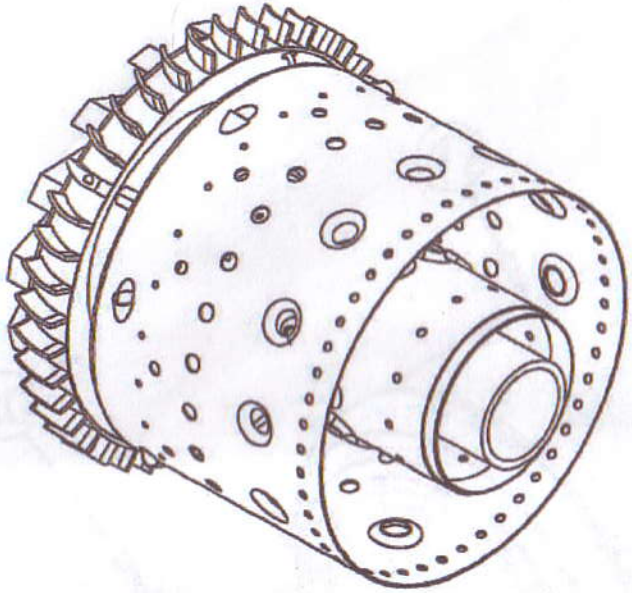
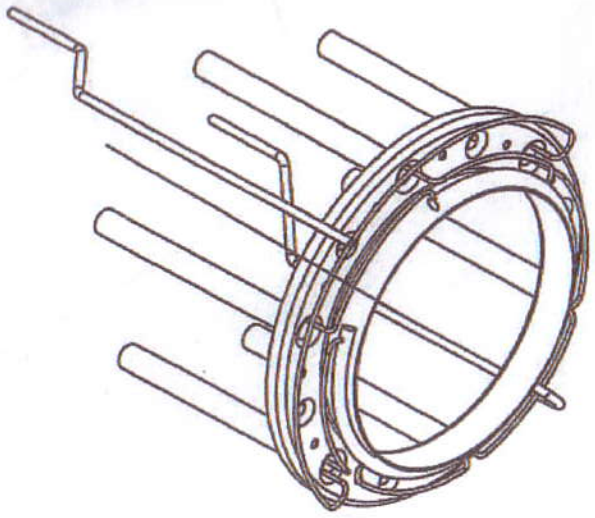
Artes Turbine KJ 66 – Kit							





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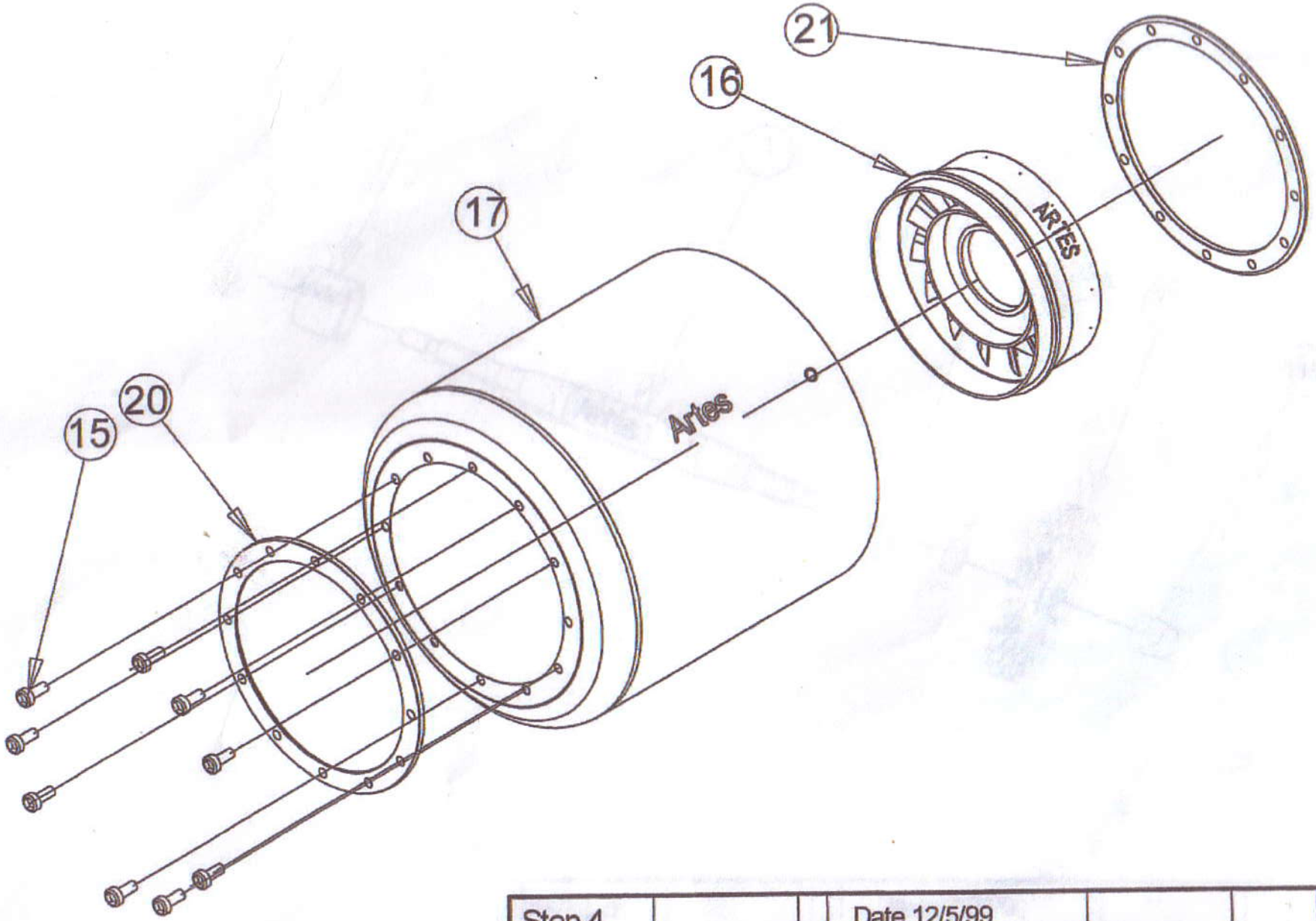

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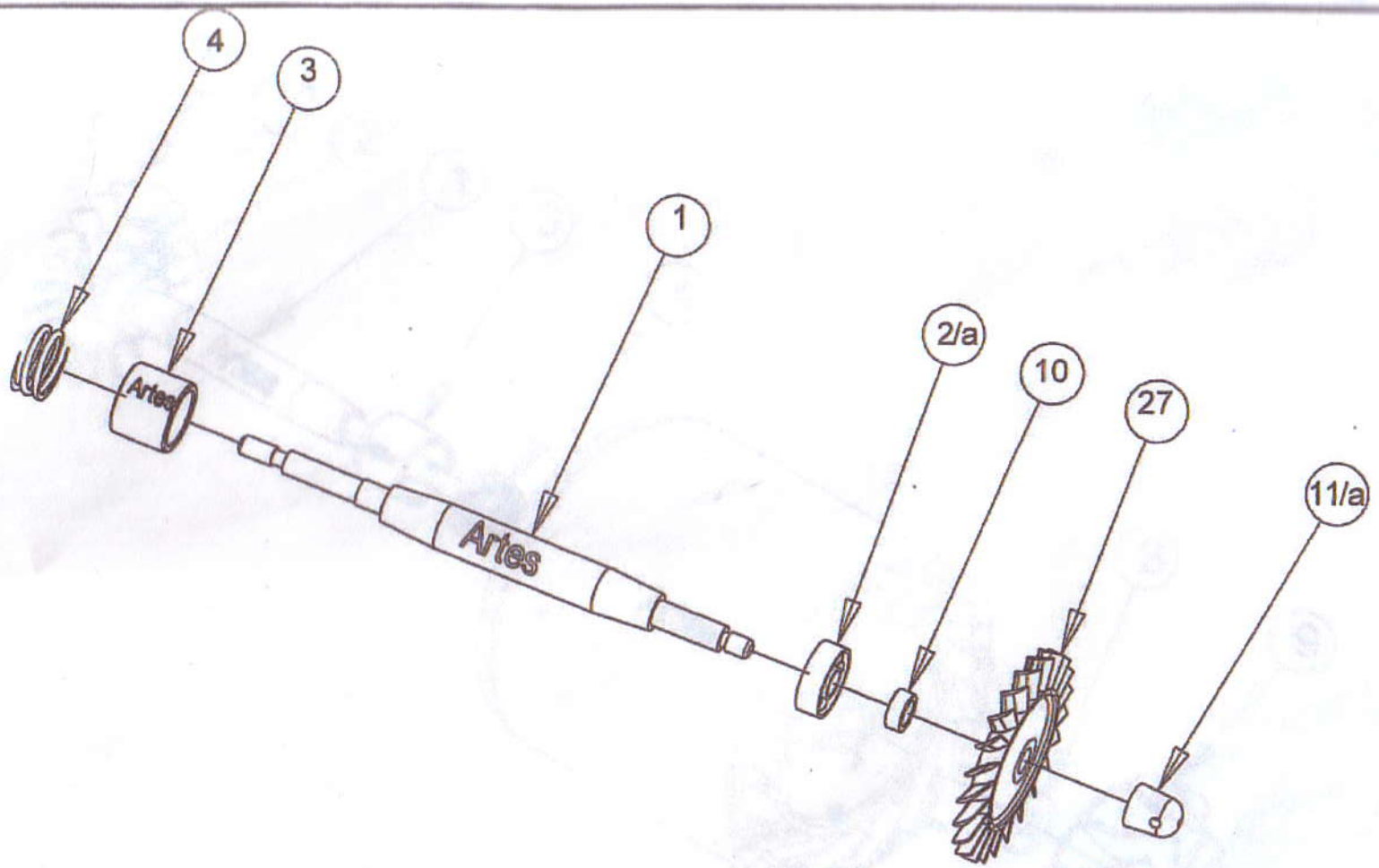

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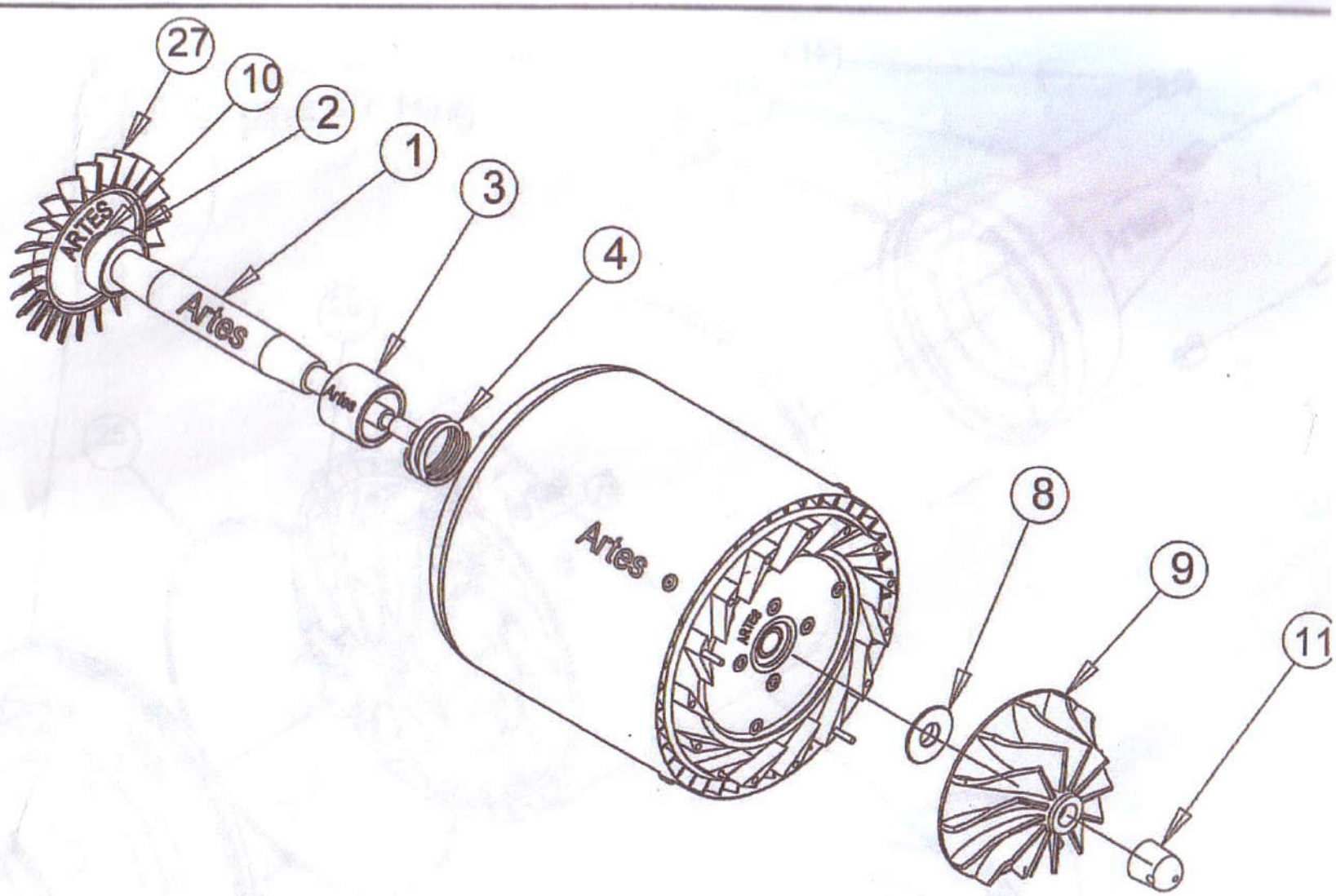

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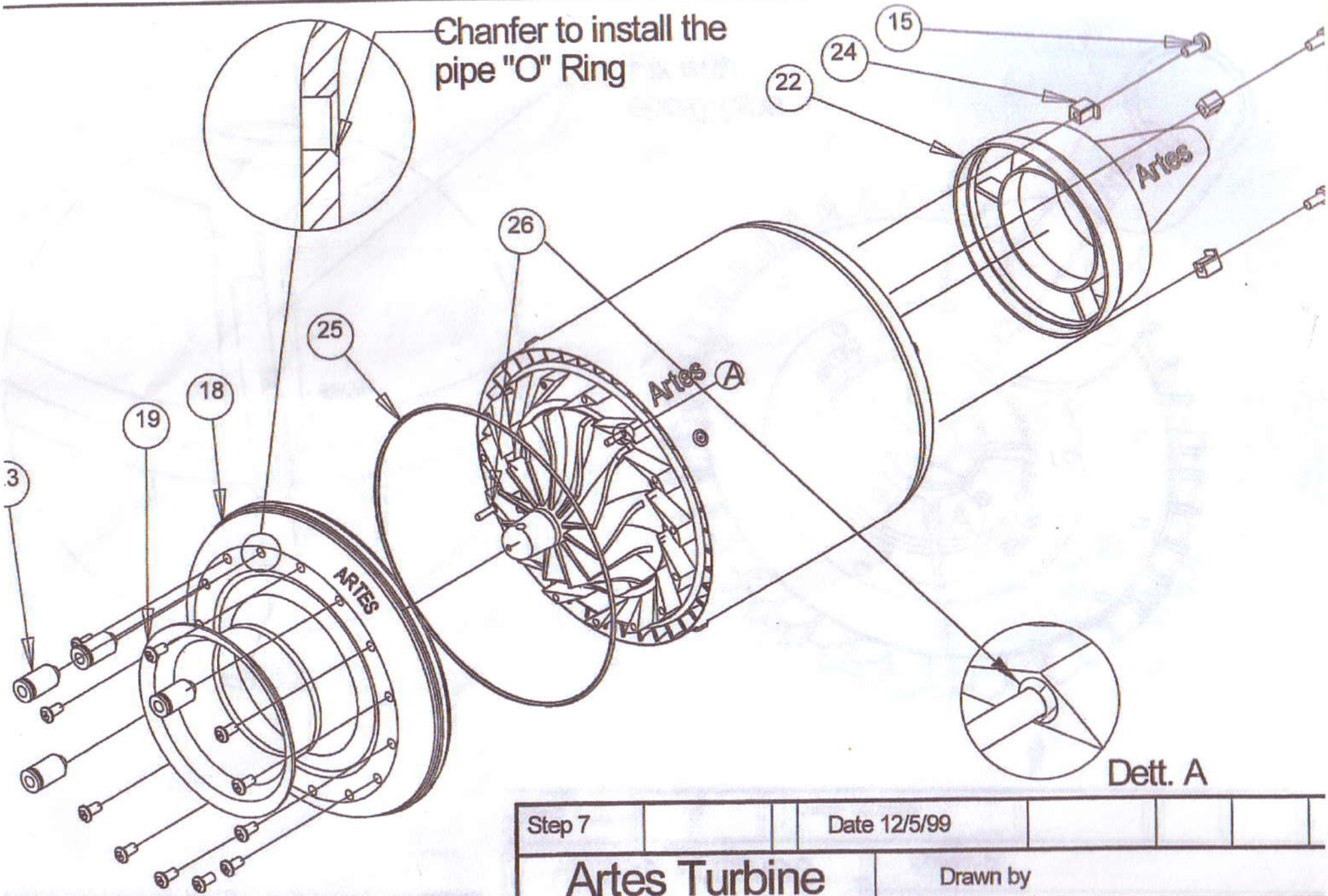

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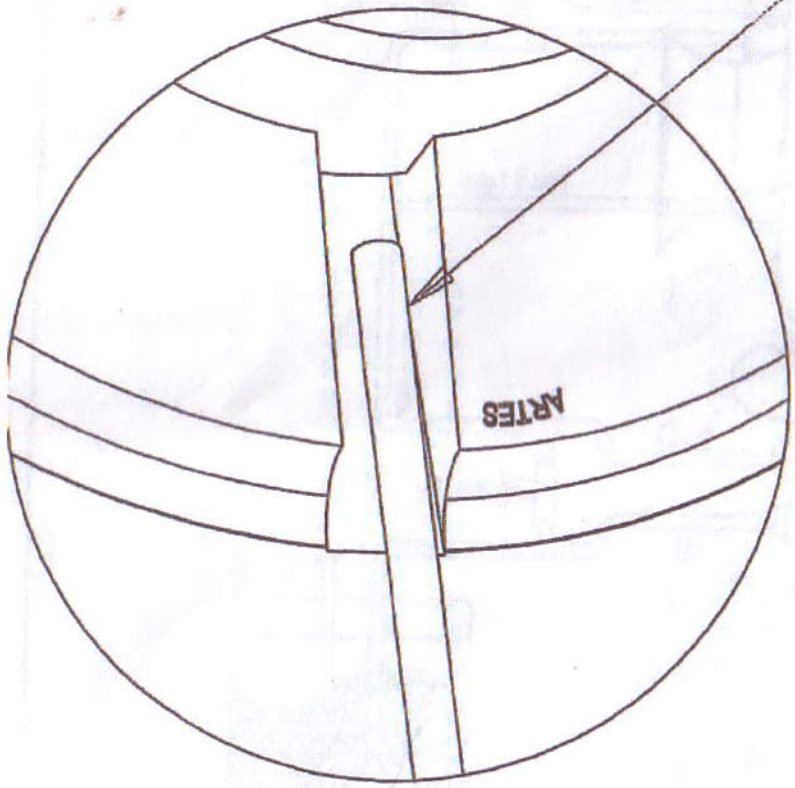
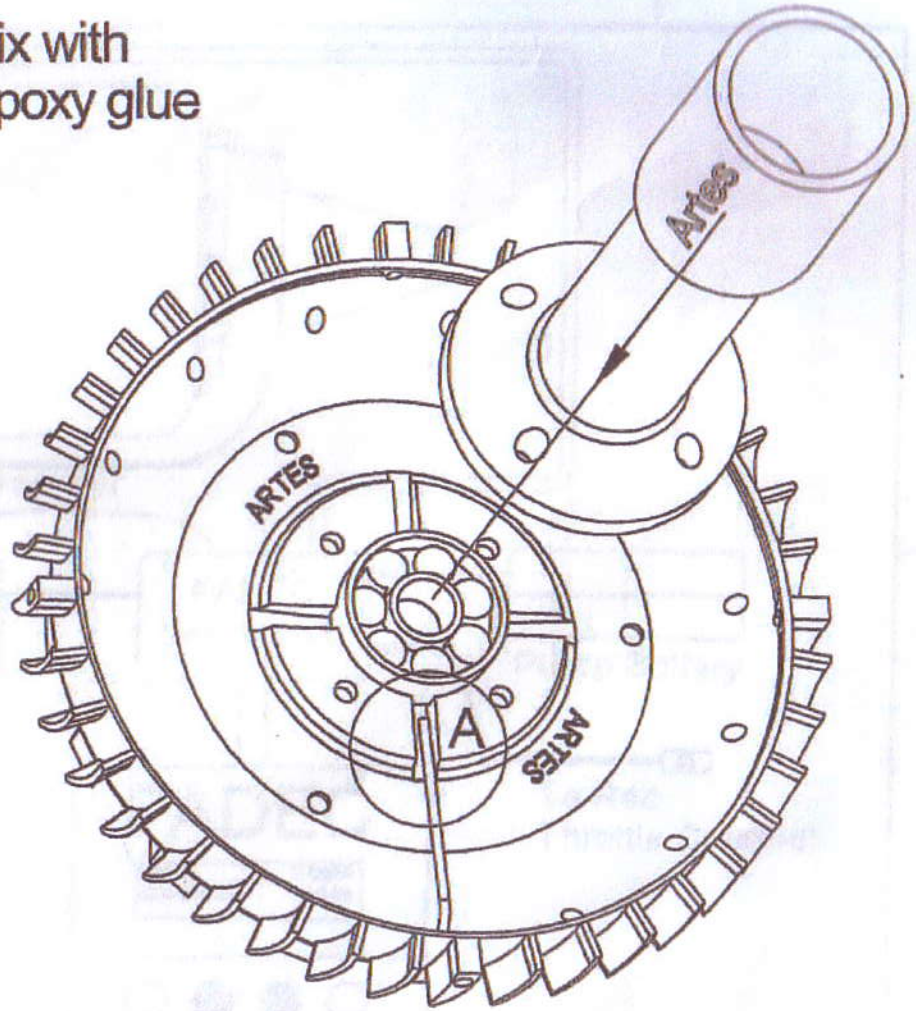


DETAIL "A"

Fix with
epoxy glue



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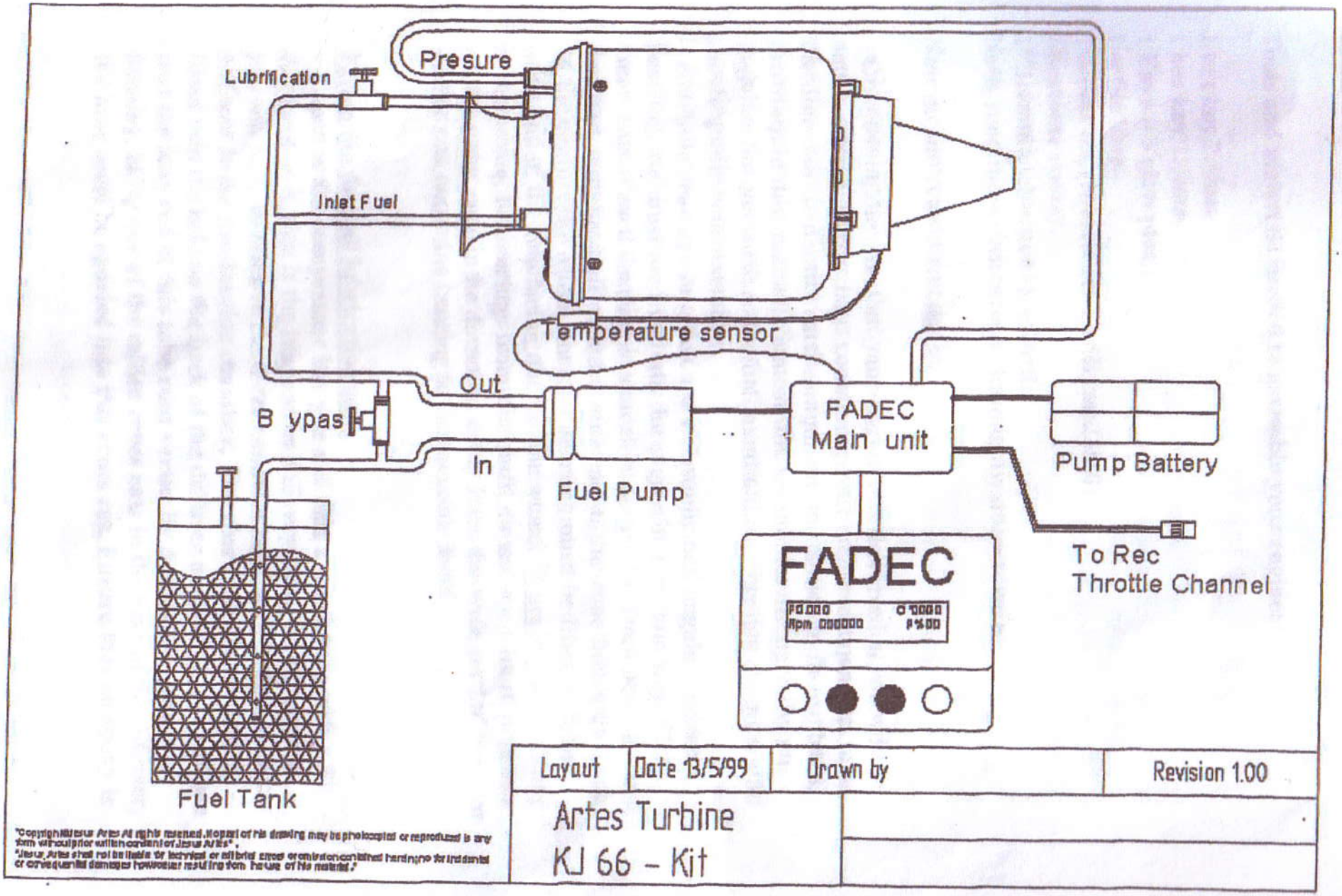

First View of the Assembling Manual:

Tools and materials needed to assemble your engine:

1 hex key 2.5mm
1 hex key 1.5mm
1 Enya # 3 glow plug
Loctite blue.
Turbine oil, (Mobil Jet 1 or Exxon 2380)
30-minute epoxy.
1* 1.6mm high-speed steel drill.
Note, read these instructions thoroughly at least twice.

Now go and read them again.

On opening the box that your engine was delivered in, you will notice several plastic bags containing your engine components, take the time now to identify each component in relation to the exploded drawings in this manual. Some of the assemblies are partially put together for you such as the fuel manifold, combustion chamber and nozzle guide vane assembly.

Note, the bearings supplied are a ceramic ball angular contact bearing, and must be fitted into the engine in a certain way. The inner race of each bearing is conical in shape, the front bearing must be fitted onto the shaft with the wide end of the cone facing the back of the compressor wheel, the rear bearing must be fitted with the wide end of the cone facing the turbine wheel. Warning, when fitting or removing the bearings from the shaft, do not use a lot of pressure on the outer race in the direction away from the wide part of the cone as this can cause the bearing to disassemble itself.

Fitting the fuel/oil lubrication tube.

Taped to the compressor box you will find a small tube with a 90 deg bend in it, this is the lubrication delivery tube. To fit this tube you will have to remove the three counters sunk screws that hold the diffuser to the combustion chamber. The short end of this tube is fitted into the hole on the back of the diffuser marked O, you will see that the long end of this tube runs vertically down to the bearing housing, along one of the milled cross cuts in the rear of the diffuser, the tube must be epoxied into this cross cut, Ensure that no epoxy is

allowed to block this tube or over flow onto the back face of the diffuser housing.

Shaft and shaft support tube assembly.

All of the rotating parts of this engine are pre balanced as individual items.

Take the shaft support tube and gently press the front bearing into place, ensuring that the bearing is the right way round, you will see four threaded holes in the front face of the support tube, these correspond with four holes in the diffuser. Attach the support tube to the diffuser using the four counter sunk hex screws, Loctite these in place and tighten firmly.

Now refit the diffuser to the combustion chamber, remember to Loctite the three screws in place. Also ensure that the gas feed tube fits into the rear of its nearest fuel delivery stick. Ensure that the three tubes, i.e. Fuel, Gas and Lube all fit into their respective FESTO fittings on the diffuser.

Take the main shaft and fit the rear bearing to it, once again ensuring that the bearing is the correct way round, fit the turbine wheel spacer, then the turbine wheel (note the word ARTES that is cast into the wheel, faces the front of the engine). Now fit the turbine wheel retaining nut, this is a left hand thread and should not be over tightened. Now take the thrust collar and slide it over the shaft from the front end, followed by the spring, once this is done slide the shaft assembly into the shaft support tube and through the inner race of the front bearing. Be very gentle at this point as any misalignment and undue force will cause the front bearing to disassemble. Once you have the shaft correctly located in the shaft support tube, gently push the shaft forward and fit the compressor spacer, the widest face of the spacer fits up to the back of the compressor wheel, then fit the compressor wheel and compressor nut, once again this is a left hand thread, do not over tighten.

You should now have the diffuser, combustion chamber, and nozzle guide vanes and rotating assembly all in one piece, the rotating assembly should spin freely if all is correct. Do not spin the engine unless you have lubed the bearings, as you will damage the ceramic balls.

Now take the diffuser front cover, and look on the inside of it where the four FESTO fittings screw into it. The ends of these fittings

should be slightly countersunk, three of these fittings correspond to the three tubes pointing forward from the diffuser, and onto each of these three tubes you must fit one of the small O-rings supplied.

When the diffuser cover is fitted, these small O-rings form the seal between the FESTO fittings and the tubes.

You will notice a groove cut into the inside of the diffuser cover, into this groove is fitted the large O ring supplied, it is good policy to lubricate this O ring to help the outer casing of the engine to slide under it.

Once you have the tubes and O rings in place you can then fit the diffuser cover, gently snug up the bolts with a 2.5mm hex key, once this is done spin the rotating assembly over by hand to make sure all is free and clear.

Now look closely at the back of the combustion chamber, where the turbine wheel is located, you will see a ring of bolts, you must remove these bolts, once removed you will be able to remove the outer case-clamping ring.

Take a look around the outer edge of the diffuser vanes, you will notice that there are four of these vanes that are thicker and have threaded holes in them, these are to accept the outer case screws.

Take the outer case and before fitting, line up the glow plug hole with the corresponding hole in the combustion chamber, then slide the outer casing over the combustion chamber, ensure that the four mounting holes in the outer casing correspond with the four holes in the thick diffuser vanes. Also that the large O-ring has not moved from its groove in the diffuser cover.

Ensure that the rim on the nozzle guide vane assembly, at the rear of the engine, has located in the hole at the rear of the outer casing. Now fit the four front outer casing screws, do not over tighten.

The next stage of the assembly is quite tricky, you are now going to fit the outer casing rear clamping ring, and the problem is that the inner ring is inside the casing. Take the engine and hold it compressor upwards, so you can see the holes that run around the rear of the outer casing, give the engine a good shake, to get the inner clamping ring flat against the outer casing, then use a 2mm diameter probe to align the holes in the inner clamping ring with the holes in the outer casing, when this is done hold every thing steady in one hand and with the other hand, bring the outer clamping ring with

one bolt through it, into position and very carefully screw the bolt in about half way.

You should now be able to fit the rest of the bolts. Note: you will see on the outer clamping ring that there is a groove on one side of its inner diameter; this groove is fitted towards the engine casing. When tightening up the clamping ringbolts, you must do it progressively and uniformly to ensure correct alignment of the nozzle guide vane assembly.

Before preceding any further, it is time to check the pre load on the bearings, and that the pre load movement is not excessive.

To do this take the engine in both hands with the compressor end facing away from you, grip the engine firmly and with your thumbs on the turbine wheel in the three and nine o'clock position press forward. You should be able to feel some movement, now at the same time as you press forward, partially rotate the turbine wheel and listen for any rubbing of the compressor wheel against the compressor wheel housing, there should be none. If the compressor wheel rubs, then you will have to disassemble the engine and check all is correct.

Take the exhaust cone and work out where you are going to fit the temperature probe, measure 6mm in from the back face of the exhaust cone and drill a 1.6mm hole to take the probe. This is covered in depth in the FADEC instructions.

You will find in the supplied parts, three small cubes of steel with a hole through them and a recess cut in them. These are used to clamp the exhaust cone to the engine, the recess hooks onto the raised ring on the exhaust cone, these are fixed in place with three of the outer casing clamping ring screws.

When all of this is done, check the free rotation of the shaft and wheel assembly, there should be no blade strikes or undue friction.

That is the engine assembled!!!

Be careful starting your engine until you feel you are absolutely sure with the starting procedure in a test bench before trying to fly.

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Jesús Artés de Arcos Marco
Dr. Ingeniero Industrial

Dear Friend:

Only the last recommendations for starting your jet engine.

If you follow the instructions, your engine will start at the first time without any problem. To do so , I recommend you to adjust your engine in this way.

Made a fuel oil mix with any good Jet oil , MOBIL , EXXON etc.

At 6% of oil

Adjust the needle of the oil restrictor to permit at idle , 1 drop per second and at full trotle , one droop behind the other , never a continuos flow , if you give to much oil , once the engine running , you will have flame out of the exhaust

For starting , use a small electric motor , like the ones used in electric racing cars , giving 25.000 to 30.000 rpm and glue in the shaft a hard rubber tube like a normal electric starter for termic engines

Push a little with the electric motor , in the front nut of your jet engine , give a short touch to the switch ,permitting your engine start runing ,

in this moment open the gas and your glow plug or ignitor . Gas will ignite and temperature in your engine will start rising . When temperature reach 100° Pump will start sending fuel to the injectors

At this moment the noise will show you that engine is runing with fuel instead of gas ,close gas and follow with your electric motor , until the green light in the fadec stops .

!!!!!! Very important rule !!!!! Once gas ignite at the first time ,when you start your engine ,you must follow all time pushing with your electric motor in the front nut , until the green light stops , otherwise the rpm's in the jet engine will slow and you will have flames outside ,if so !!!!stop engine with your transmitter !!! ,and try again.

To final adjust the fuel bypass. Put your engine with the transmitter at the max pressure you want to adjust, for instance 1 bar or 7.5 Kg

One in this moment close the bypass until the engine try to go faster , that mean is the point were the fuel is going to the engine instead to return to the tank . After this you must unplug and plug your Fadec in order to give the news datas like the one you want to fix ,otherwise the

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Fadec will run two or three times in a false limits until he learns the new dates he must use.

REMEMBER!!! Do NOT STOP the electric motor until the engine turn off the green light in the Fadec.

Before flying! Check all the area around your engine. No fuel flooded, no papers or loosed thinks that could be sucked for the engine.

Be sure before starting that your engine doesn't have any fuel inside, if you'd started in this conditions you would ruin your engine.

The GRW bearings are of the angular contact type and they are fitted in the engine with the wide part of the inner race facing the back side of the compressor and turbine wheels. At the same time, to fit the bearings in the shaft just use a tube pushing only in the inner ring in order to avoid to dismount the bearings.

I hardly recommend to you use Loctite 222 in all the screws of your engine in order to prevent disassembling in case of vibrations.

Jesús Artés de Arcos Marco
Dr. Ingeniero Industrial

IF YOU FOLLOW THIS INSTRUCTIONS YOU WILL HAVE HOURS OF PLEASURE RUNNING AND FLYING YOUR ENGINE.

I WISH FOR YOU AND YOUR ENGINE ALL THE BEST ALL THE TIME.

ENJOY IT!!

Jesús Artés de Arcos.